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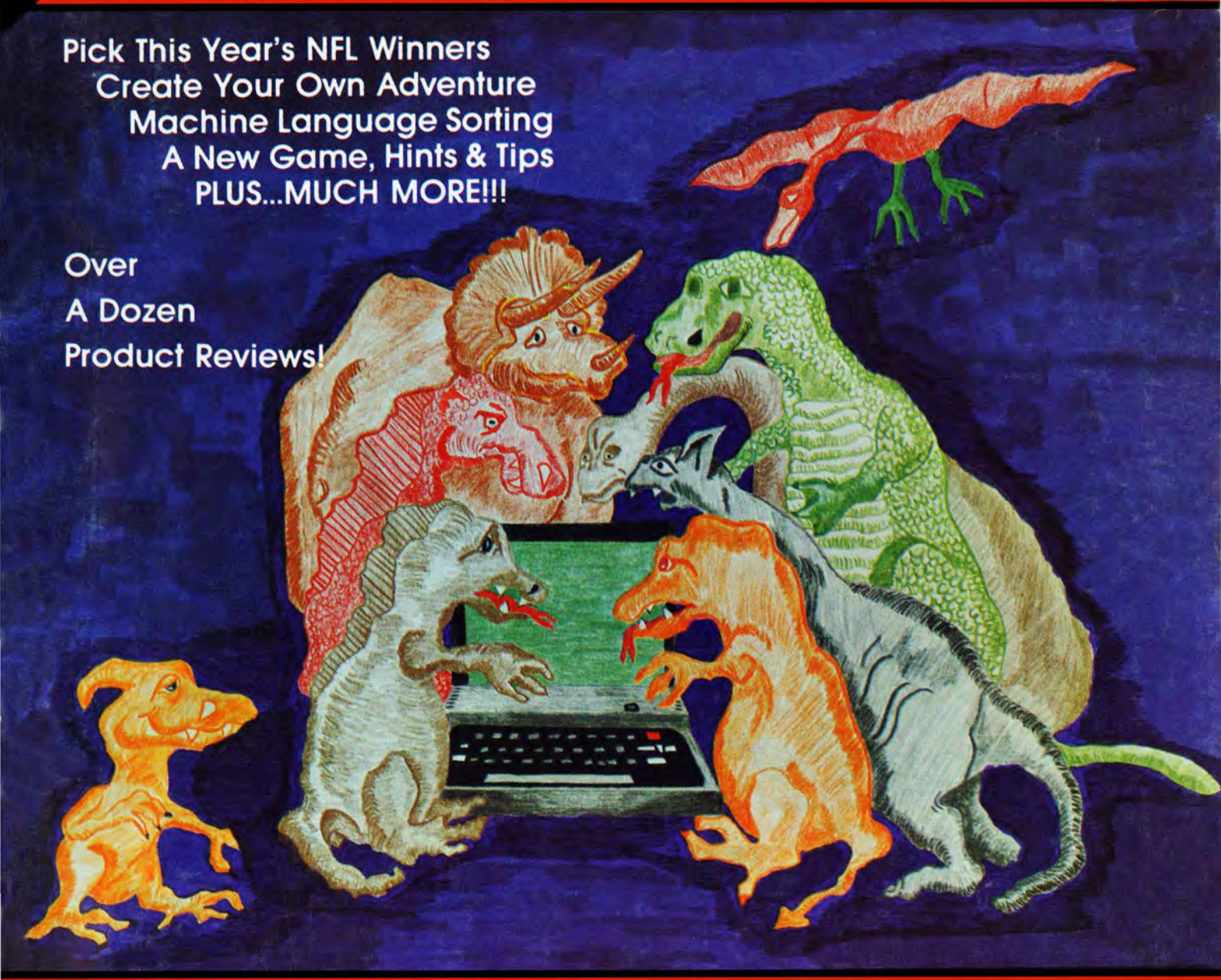

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Cover line drawing in pencil by D. Patrick Sullivan. Color separations by Kelly Color Service.

NOTICE

A notice about a new, corrected, deadline for the RAINBOW Adventure contest appears on Page 46. Those planning to enter the contest (we hope you will!) should read it as an incorrect deadline was printed last month.

An important notice concerning the RAINBOW SEAL OF CERTIFICATION appears on Page 33. We urge every reader to take a moment to look at this short clarification.

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The RAINBOW is published every month of the year.

LETTERS TO RAINBOW

A CRUMMY HINT

Editor

RAINBOW ON TAPE is a fine idea and the April issue was a good time to start with its large number of interesting programs. I have enjoyed shooting turkeys, snails and ants but *3D MAZE* was a refreshing innovation in graphics games.

Unfortunately, I like both the "trail of crums" and the more attractive maze, so the following changes were necessary to give me both:

```
170 PMODE3,PAGE : COLOR 5,6
230 IF X1=TX AND Y1=TY THEN CIRCLE (126,CY), CR, 5, .5 : PAINT (126,CY), 7, 5
235 IF M(X1, Y1)=1.1 AND TL=1 THEN CIRCLE (126,CY), 5, 5 : PAINT (126,CY), 8, 5
```

Thanks for dropping the "CoCo" nickname and adopting "80C."

Dr. Lane Lester
Lynchburg, VA

"COCO" v. "80C"

Editor:

We are not a post-scripted 80.

We do not have a Z-80 or 8080 CPU.

We have a 6809, the most advanced 8-bit MPU available.

We are Cocos.

We are better than TRS-80's.

COCO POWER! COLOR IS BEAUTIFUL!

J. C. Kirksey
Houston, TX

Editor:

I like CoCo a lot more than 80C. Some may say it sounds clownlike and toyish. No matter! The name CoCo is warm and friendly like a good computer should be. Besides, just as a large man can enjoy being called "Tiny," a 6809 based powerhouse can enjoy a name like "CoCo."

I wish you'd change it back.

Roger Damm
Pheonix, AZ

Editor:

I would like to tell you that I enjoy your *RAINBOW*. Usually I sit down and read most of the magazine in one shot. That's how interesting it is.

There is something, however, I don't like. This is your decision to rename CoCo to 80C. Why 80? How does this beautiful machine relate to 80?

Your justification was because CoCo sounds a little bit "clowny." Remember that the name does not make the computer better or worse than it really is. Is the legendary "Apple" name anything more serious than CoCo? Certainly it isn't.

In some Latin American countries, "coco" means the head, the brain. And that's exactly what the Color Computer is, a brain. As a matter of fact, it happens to be a very good brain, as more users discover every day.

Sergio Zigras
Paramus, NJ

LP VII SMARTS

Editor:

Prepare thyself for a tongue lashing. "NON-INTELLIGENT!" Is that what you called my LP VII? Humbug! The Line Printer VII is a dot matrix printer just like the Epson and Microline, which means to me that it is just as smart as the programmer behind it.

Enclosed is a high-resolution picture designed by Jim Barringer. Not bad for a Line VII "NON-INTELLIGENT" Printer.

Even this letter, with the help of the *WORDCC7* word processor by Kathy Goebel has been magically produced by a LP VII. And beware, this is a WARNING—I am sworn to secrecy, but I have seen the results of a program which is in development that may have you eating your words.

I hope you have taken this letter in a humorous vein because that's how it is intended. I know what you mean to say. I just couldn't resist the opportunity to defend the LP VII.

Dave Hooper
Hoffman Estates, IL

(Editor's Note: We wish we could reproduce the graphic printout to which Mr. Hooper refers, but its content is a drawing of creatures to which a Mr. Charles Schultz holds a copyright.)

FOR POSTERITY

Editor:

After speaking with you, I went back and corrected the *DSK*INDX* program and everything works perfectly now. I suspect there may be others out there who, like me, have just gotten a disk and are going to back issues to type in all the disk utility programs. You might consider publishing this letter, as I have listed the corrections below:

*DSK*INDX*, Pages 24-25 of the February issue:

Line 130, "!" should be "DSKI$"
Line 242, "!" should be "FREE"
Line 365, "!" should be "KILL"

DISK DIRECTORY PRINTOUT, Page 31 of the March issue:

Line 280, "!" should be "FREE"

I also recommend the *SAVEM* program on pages 42, 44 and 46 of the April issue.

A. Arnold Weiss
Philadelphia, PA

MONITORING MONITORS

Editor:

Recently my color TV started dying. Rather than buy a new TV, I decided to buy a color monitor. A local computer store had a good price on an Amdek Color, so I bought one. To make a long story short, it didn't hardly work at all.

The first thing I did was to add the rather simple circuit suggested by Dennis Kitsz in *80 Microcomputing*. It didn't work. With a great deal of help from a friend who is more hardware inclined than I, we decided that the problem was the output voltage from the Color Computer. The Amdek specifies 1V into 75 ohms. Into that impedence, my Color Computer outputs less than 0.7V.

The solution seemed obvious. Just add a video amplifier. So, we built one, using a standard circuit and the 5V power supply. By cranking it all the way up, we were able to get almost 1V. Hooking up the monitor, colors looked fine but text still looked awful. We also got occasional distortion of the vertical alignment, which could be corrected by turning the gain down and then back up again. The conclusion seemed to be that we were loading down the power supply too much.

I took the monitor back and the store was good enough to refund the purchase price.

Least anyone think that I am trying to run down either the Amdek or the TRS-80C, let me say that the Amdek is a beautiful monitor—on an Apple or an Atari or a Vic. I was also able to use the Kitsz circuit on my computer with a different monitor with excellent results. I think that the lesson is that if one wants to buy a monitor, be careful. If the monitor has only a low impedence input and requires a lot of juice to drive, be prepared to use a video amplifier with an external power supply or go to a less demanding monitor.

David Cochran
Norristown, PA

FINDING YOUR WAY

Editor:

A prolific programmer can quickly become lost in a pile of tapes and program-start counters. I have found this little program (which always begins at 010 on each side of a cassette) to be very useful.

When the program is modified, I re-CSAVE it at 010, preceeded by MOTOR ON with record activated.

```
10 CLS
20 LIST 30 -
30 ' ... Tape 1 SIDE A ...
40 ' PROGRAM COUNTER REMARKS
50 ' TRAMPLE 131 BOARD GAME - 4
60 ' READNSAY 050 NEEDS SOUND
70 ' ETC ETC ETC
```

John Plaxton
Greenwood, Nova Scotia

FINDING MEMORY

Editor:

July was beautiful! Even with *80 Micro's* increased coverage, they can't touch you.

One answer to Mr. Kennedy's question about amount of memory which is being used (*Letters, July*) is a routine I use a lot in my programs:

```
1 CLEAR200 : GOTO 9000
10 AV=80 : M=MEM-700 : T=INT (M/(AV*10)) : POKE 1024,T : POKE 1025, AV : CLEAR (M-T*50) : T=PEEK (1025)
20 DIM A$(T)
9000 PCLEAR1 : GOTO10
```

AV is the average record length. M is the available memory after the PCLEAR minus a growth factor. T is one-tenth the calculated array slots so the figure is less than 255. Memory left is cleared less five bytes for each slot (address space) but since T is 1/10th you CLEAR (MEM-T*50). Then T and the average record length are retrieved from the safety of the screen. Under DOS, this is the safest place to store these values.

The routine compensates for those times you have a machine language program in high memory. I wrote it to get away from the memory size question in the earlier versions of *C.C. WRITER.*

W.L.C. Dye
Transformation Technologies
Bloomingdale, IL

CLUBS

Editor:

Are there any local clubs either in Manchester, NH, or Nashua, NH? I live at 80 Doris Street in Manchester, but Nashua is only 20 miles south of here.

Jim Goodell
Manchester, NH

Editor:

Please advertise the existance of our club in your next issue. I am the secretary of the Sudbury & District Colour Computer Club and can be reached at 1557 Dearbourne Dr., Sudbury, P3A 5E6 or at (705) 560-0314.

Thank you for making the Colour Computer the best.

T. A. Donnelly
Sudbury, Ontario

Editor:

We are trying to form an 80C user's group down here in El Paso. My friend and I decided to when we discovered the 80C is becoming more and more popular.

Both of us think your magazine is fantastic. We would appreciate your help in any way possible because we are just teenagers and we want to get off on the right foot.

We are asking for only younger owners of the 80C to join because we are a bit skeptical of how an older member would act toward two teens.

The title of the group is the Northeast El Paso Color Computer Club and people can write me at 3640 Olympic, or Chance Geurin at 8209 Tonto Place. Our zip codes are 79904. My phone is 757-2422 and Chance's is 755-2102.

Rob Skipper
El Paso, TX

Editor:

I am interested in getting a TRS-80 Computer User's club started in the Hoffman Estates-Schaumberg area of Illinois. Please ask anyone interested to call me at (312) 885-2573 or to write me at 580 Milton Lane, Hoffman Estates, IL 60194.

Richard Ekstrom
Hoffman Estates, IL

Editor:

We started a Color Computer Club in Sacramento, CA. We had 20 members at our first meeting and expect a lot more at the next one.

We would like to see *the RAINBOW* as the national magazine for the Color Computer. For those who live in the Sacramento area, please contact me at (916) 924-3719.

Sal Alestra
Sacramento, CA

Editor:

We are starting a user's group for the 80C in the Kansas City area and would like to have anyone interested in joining contact me. The group is the Mid-America Color Computer User's Group and information can be had by calling me at (816) 833-0367.

Bob Colin
Independence, MO

MOVE SCREEN PRINT

Editor:

The program listed below will relocate the Radio Shack screen print program to the upper memory of a 32K Color Computer. The user, of course, should first purchase a copy of the screen print program, load it, type in this routine and run it. Once execution of the program has been completed, type:

CSAVEM "SCRPT32", 32128, 32688, 32128

This will save a copy of the new, revised 32K version with the proper offsets for execution. Any memory address references in the manual should now be referenced by using the manual's value and adding 16,384 to it. Before loading, you should type:

CLEAR 200, 32127

This will reserve the correct amount of memory. By the way, I found that typing a shifted up arrow was not a very nice way of starting the routine, so I found a way to change it.

This can be done by POKEing &H7DA5 with the ASCII value of the key you would like to use for starting the routine. I personally liked a shifted CLEAR key (&H5C) because this did not interfere with the EDIT function as the shifted up arrow did.

```
10 REM PROGRAM TO RELOCATE
20 REM RADIO SHACK SCREEN
30 REM PRINT PROGRAM FOR USE
40 REM WITH A 32K TRS80C
50 FOR ZZ=15744 TO 16303
60 IN=PEEK(ZZ)
70 A$=HEX$(ZZ)
80 IF A$="3F" THEN IN=&H7F : GOTO 110
90 IF A$="3D" THEN IN=&H7D : GOTO 110
100 IF A$="3E" THEN IN=&H7E : GOTO 110
110 POKE ZZ+16384, IN
120 NEXT ZZ
```

Ed Krikorian
Longwood, FL

HARDWARE HACKERS ARISE

Editor:

I am considering writing an article or two on things that can be done with the expansion port of the TRS-80 Color Computer. It would be good if I could get some feedback from readers of *the RAINBOW* on what they might be interested in.

These would be construction-type articles to include a 16-bit I/O port, a hardware RS-232 port, an analog to digital or digital to analog converter hookup, hooking up a real time clock to the Color Computer, or other types of articles in which readers might be interested.

Please write me directly at 6959 Goshen Road, Goshen, OH 45122, and if there is enough interest on a particular subject, I may write about how to do it for the magazine.

I have been reading *the RAINBOW* for about eight months and am very pleased with its contents.

Leroy Hall
Goshen, OH

VIDEOTEX ROMPAK SAVE

Editor:

For owners of the Radio Shack *Videotex* ROM Pak, you can save pages to cassette and/or print the information.

By placing a piece of tape over pins seven and/or eight of the ROM Pak, the auto-start is disabled. Pin seven is the *first pin on the right* of the ROM Pak when viewed from above. Pin eight is just below pin seven. To run *VIDEOTEX* after disabling the auto-start, just type in EXEC 49152.

You may have to hit ENTER quickly or else the program will sense keyboard-bounce and put you in the Advanced Storage mode. If this happens, just hit BREAK.

After going "off line," you find that you want to save the information on tape, push RESET and then type in CSAVEM "", 3072, 16383, 3072. This dumps memory to tape except for the first page. You need the first page in ROM to hold the driver program.

To load the saved information, CLOADM and use a driver BASIC program to POKE RAM 3072 and up into video memory, 1024 to 1535. The February, 1982 issue of *TRS-80 Microcomputer News* has a program to print *VIDEOTEX*. If you use that program, change Y to 512 and X to 1536.

The same method to disable the auto-start will work on the *CHESS* ROM Pak and—by POKEing 65495,0 before you EXEC 49152 to start it—you can speed the game up.

I believe a small modification of Dennis Lewandowski's machine language column program from the June issue could be used with the above modification to display all pages of memory. The short machine language program could be placed at decimal 285-337 before running the ROM

—Continued on Next Page

Pak, I think.

James Ali
St. Albans, WV

(Editor's Note: Two *Videotex* print routines appeared in the October, 1981, edition of *the RAINBOW* in addition to the program to which Mr. Ali makes reference from *TRS-80 Microcomputer News*.)

SUGGESTIONS

Editor:

Your magazine improves with each issue! I think that a few suggestions would be in order. Here they are:

Firstly, why don't you put an asterisk preceeding each listing in the contents that will be in *RAINBOW ON TAPE*. Also, you could take a reader survey to find out the different types of equipment us readers have. That might help improve what kind of programs to give listings of and which to review as well as what to write in articles.

One issue you might try is reader service. Or ads from individuals in a "classified" type section. I think you should focus on e-x-p-a-n-s-i-o-n. Your magazine has the quality, now it needs the quantity. I'm an avid reader.

Andrew Nulman
Providence, RI

(Editor's Note: We don't "mark" *RAINBOW ON TAPE* listings in the contents because *all* the program listings are usually included in the service. We do mark the listings themselves with the *RAINBOW ON TAPE* symbol. We plan a reader survey, but we want one that is comprehensive and will do some good. Its important that such a survey be more than just a way for you to *think* you have some input. In other words, when we do it, we'll do it right. We've explored Reader Service from time to time, and will continue to do so. The problem with all reader service programs is the long delay between the time you send in the card and the time you get an answer. Its certainly faster and almost as easy for you to write the firms directly. And that way, too, you can get more personalized attention.

(As to your last point, expansion, we grew from four pages to 64 between July '80 and July '82. This issue is far bigger than last month's. A lot of the reason for that—as we have said before—comes from our ability to attract advertisers. You, our readers, can really help by mentioning *the RAINBOW* whenever anything you see here generates your interest. And, you might question those who do not advertise here. Ask them why. If they wish to support the Color Computer, this is one way to show it.

POT REVISITED

Editor:

I wrote you quite a number of months ago, saying I thought that your magazine was a real "Pot of Gold" for us Color Computer users.

Well, I just received the July, 1982, "Happy Birthday" issue and I would like to revise my comments somewhat. If there is anything *more* valuable than a pot full of gold, that's what I feel is the worth of *the RAINBOW* now!

It is absolutely the best.

Pete Matthews
Detroit, MI

Editor's Notes...

PRINT #-2,

We are extremely gratified here about the reaction to the new format which came about in July. The color cover—which, as you see, is going to be a permanent happening—and the typesetting have received good comments from many of you. For those who did take the time to send along their good wishes, thank you.

We intend that you will see steady improvement in *the RAINBOW* as time goes by and we get a little more used to dealing with some of the new-fangled stuff that we are now using. Some of those things begin to be in evidence in this issue, such as the capability to do charts and the like as accompany the article on ROM subroutines. We just could not do that sort of thing before, simply because doing it on a line printer took up too much editorial space. Now, they take up so little space, relatively, that you will see more of this type of thing as time goes on.

One of the main advantages of having type rather than dot matrix printer is so obvious that it caught me by surprise. That is that type takes up so little space. I mentioned this in my column last month, but it really hit me over the head this time around.

The reason was simple. When John Waclo's final part of his NFL series came in, it was eight and one-half pages, single-spaced, all the way across the page. I was immediately worried that we wouldn't have room for much else this month, because by the old standards of dot-matrix printing, that would have translated to about 11-plus pages of copy!

But, right now, it looks like John's article will be something like three full pages in type. Frankly, it led us to look for a couple more things to add to this month's issue, which, by the way, is by far the biggest we have ever produced.

The Waclo article led me to do a little figuring on the 80C (after all, why have one if you can't go playing around with figures and things), and by the best estimate that I can make, we would be running a magazine of more than 120 pages this month *if* we were setting it on the printer as we did in the past. That is even if we took advantage of the ability to reduce the pages and set the lines closer together—which we did in April, May and June.

Just setting the lines closer gave us an additional 11 lines per column, so, you see, we were already getting "more" out of our space than setting it "straight." There are so many variables in all of this that we probably wouldn't be getting *the RAINBOW* out on time this month if I took the time to write a program to figure it all. But, my best guesstimate is that this month's issue would be about 150 pages if we just ran it on a computer printer all the way with no fancy stuff.

All this excercise is by way of saying that you may feel there is a larger proportion of advertisments in this month's issue than ever before. In terms of pages, that is true. But, in terms of available information, there is easily more by one-third (and maybe closer to one-half) editorial material than in the past.

The increased space afforded by (1) typesetting, and, (2) more advertising means we can do things we never even dreamed of before. For instance, you might note there were two 32K programs in last month's issue. This time out, note the length of Dennis Lewandowski's column, Bill Nolan's effort, the aforementioned Waclo story and Pat Litsak's program and listings for the machine language sort. There is a lot more, but that's hefty stuff. In short, more information about the Color Computer, we believe, than in all the rest of the magazines combined.

By the way, that is not meant to knock the fine people who publish those other magazines. Or to knock the magazines themselves. Besides reading David Lein and Bob Albrecht, I learned BASIC thanks to *Creative Computing*, *80 Microcomputing* and *80-U.S. Journal*. But a lot of what I learned was in converting programs for the Model I/III and the Apple II to the 80C.

That was some time ago, as the computer world goes. You don't have to do that sort of thing any more. I would say that the best programs being written today are for the 80C. And, to a large extent, you can get what you want in the way of commercial software just by shopping *the RAINBOW's* pages. Further, you can learn a lot about programming simply by keying in some of our listings.

If you figure my figures are right, there is something on the order of 80 pages of "printer" programs, listings, tutorials, hints and reviews in this August issue. That doesn't count the ads, the things such as the Table of Contents and the like. In other words, a lot of information. I won't go into saying that I think the non-editorial content has value (many of you have written to say you think it does) and I'll only note briefly that we got almost 100 letters asking for a Table of Contents. And, honestly, those ads pay the freight for the editorial pages. So, mention us when you do make orders and inquiries. And, if your local computer store doesn't carry *the RAINBOW*, ask the people in charge why.

We started this little project as a means of communicating information about the Color Computer (80C or CoCo) and we're not about to lose sight of that. But we

—Continued on Page 73

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Tutorial...

Let's Call JOYIN To Learn ROM Call Technique

16K ECB

By Bill Nolan

Below is a short program illustrating how to call one of the built-in machine language subroutines located in the basic ROM of your 80C.

Line 10 is the critical one, as it tells 80C where to find the routine when you call for it (via USR) later in the program. The only trick to remember is that 80C uses "indirect addressing" with these built-in functions, and the instruction book does not make this clear.

Your manual says that the JOYIN routine is located at the address Hex A00A in the memory. Actually, what is located at A00A is the address where you go to find JOYIN.

Think of it like this. A kidnapper tells you to go to 10 North Main Street, and look under the welcome mat—where you will find a note telling you where to drop the ransom. 80C does it something like that. You go to memory location A00A, look at what's there, and you will find the real address for JOYIN. It is slightly more complicated than that though, because the address we are looking for is too big a number to store in a single memory location.

Part of the address we seek is located at Hex A00A (the most significant byte), and the rest is at Hex A00B (the least significant byte). To convert the contents of the memory locations to a regular decimal number, you multiply the most significant byte by 256 and add the least significant byte to it.

Why 256? Well, 256 in decimal is written 100 in Hex, so it is something like this example. Suppose you had 25 boxes, each containing 100 computers, and 37 boxes containing 1 computer. To find how many you had total, you would multiply the 25 by 100, and add the 37 to it. That's what I do in line 10. I take the number in memory location A00A and multiply it by 256 (100 Hex), and add the result to the number in memory location A00B.

The rest of the program is easy. We clear the screen to blue, then call the JOYIN routine, which reads all four joystick pots and stores their values in memory locations 15A to 15D Hex. We then read these locations, and set them in either blue or orange, depending on which joystick is used. Thus, since the screen is blue, we can draw on it in orange with one joystick, and erase with the other.

This program is simple, and not very useful. I wrote it to illustrate how to call these routines, not as a stand-alone thing. I hope you find it useful as an aid in understanding how to use those mysterious built-ins. If you have any questions, write me at the address below. Please include a long S.A.S.E. if you want a reply.

The Listing:

```
9 'GET ADDRESS
10 DEFUSR0=PEEK(&HA00A)*256+PEEK
(&HA00B)
20 CLS3
29 'CALL JOYIN ROUTINE
30 X=USR(0)
39 'READ AND SET JOYSTICK VALUES
    STORED IN MEMORY BY JOYIN AT
    15A-15D (HEX).
40 SET(PEEK(&H15A),FIX(PEEK(&H15
B)/2),3)
50 SET(PEEK(&H15C),FIX(PEEK(&H15
D)/2),8)
60 GOTO 30
```


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Utility

Sort Numeric Arrays Fast With Machine Language

By Pat Lishnak

This article concerns the machine language sorting of one-dimensional arrays. But, before you BASIC users groan and turn the page—hold on a minute.

There is also a short demonstration program and a BASIC listing that can be used to enter the machine language directly into memory, without the need of an assembler. Even if, like me, you have no need to do any sorting, it is still interesting (hopefully) to see how and why it works.

The program uses the bubble sort method. In case you're not familiar with it, it works this way: The first data element on the list is compared to the second one. If the first is greater than the second, then the two elements are switched in memory. If the first is less than or equal to the second, then the first remains in its position for the time being.

Next, the second element is compared with the third, and so on until you reach the end of the list, one pair at a time. After each pass of the entire list, the program checks to see whether any switches were made. If there were any, then another pass is made through the entire list. The process continues until a pass is made that requires no switches, *i.e.*, the data is all in order.

Seeing Is Believing

You may be familiar with the bubble sort method, but have you ever actually seen it taking place? Program Listing 1 is a machine language demonstration sort of the computer's video memory. It will arrange the contents of the video display in ascending order according to the numeric value of each character.

Listing 1

```
0001 0600                      NAM SCRSORT


0002 0600 8E0400      BEGIN    LDX #$0400      *START A PASS
0003 0603 8601                 LDA #1
0004 0605 A78D001C             STA FLG,PCR
0005 0609 EC80        AGAIN    LDD ,X+
0006 060B 3404                 PSHS B
0007 060D A1E0                 CMPA ,S+        *IS A>B?
0008 060F 2308                 BLS NOT
0009 0611 1E89                 EXG A,B         *SWITCH BYTES
0010 0613 ED1F                 STD -1,X
0011 0615 6F8D000C             CLR FLG,PCR
0012 0619 8C05FF      NOT      CMPX #$05FF     *LAST PAIR
0013 061C 26EB                 BNE AGAIN
0014 061E 6D8D0003             TST FLG,PCR
0015 0622 27DC                 BEQ BEGIN       *SWITCH OCCURED
0016 0624 39                   RTS             *BACK TO BASIC

0017 0625 00          FLG      FCB 0           *SWITCH FLAG

0018 0626                      END
```

This is not necessarily in ASCII order, since some characters have different values in the Color Computer. For instance, a space in screen memory is represented by the number 96 rather than 32. The BASIC command line FOR X=0 TO 255: POKE 1024+X, X: NEXT will show the entire possible character set in ascending order, including graphics blocks.

In case you are operating without the benefit of an assembler, Listing 2 is the BASIC program for entry of the machine hexadecimal code. The machine code itself is written in relocatable format, so it will work no matter where it resides in memory.

Listing 2

```
0 'LISTING 2
10 INPUT "START ADDRESS";S
20 INPUT "HEX";A$
30 B$= LEFT$(A$,1)
40 C$= RIGHT$(A$,1)
50 B= ASC(B$)-48: IF B>9 THEN B=
B-7
60 C= ASC(C$)-48: IF C>9 THEN C=
C-7
70 POKE S,B*16+C
80 S=S+1
90 GOTO 20
```

But, it is normally best to store machine language routines at the high end of your machine in protected memory. Since this is only a demonstration program, it doesn't really matter. Using a starting address of 3000 (decimal) will work in any machine.

The first step is to enter the BASIC program and RUN it.

—Continued on Next Page

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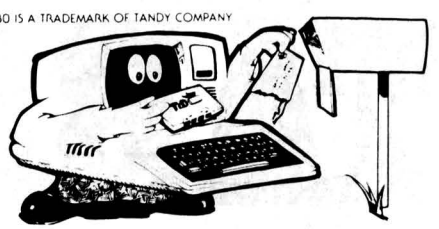

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ML SORTS — from Page 9

A prompt will ask you for the starting address in the usual decimal form (3000 in this case). After that, you begin by entering the hexadecimal code, one double-digit byte at a time.

The hex code is found in the third column of the listing, after the line number and the address. For example, type 8E and ENTER. Then type 04 and ENTER, 00 and ENTER, 86 and ENTER and so on. Type BREAK after you have entered the last byte.

You've Done It!

You now have a machine language program entered into your 80C, and without an assembler. Yes, an assembler will make it easier to do, but this works well.

The hexadecimal numbers are automatically converted to decimal by the program in Listing 2 and then are POKEd into memory. The caveat here is to be *very careful.* It is easy to make a mistake while entering the data, and it will be difficult to find. So, take a bit of extra time in this.

By the way, this approach will work with any machine language program listings you run across—as long as the code is stated to be re-locatable, or if you use the exact same addresses as are found in the assembled listing. Entering code this way isn't too bad if the listings are short.

When the program from Listing 1 is in memory, by whichever route (you can also, of course, use an editor/assembler to load it in) you can EXECute it and watch what happens. It makes for a pretty display.

Note that the program uses the BLS (Branch if Lower or Same) instruction. This is what is called an unsigned comparison in which 0 is the smallest possible number and 255 ($FF) is the largest.

So, graphics blocks go to the bottom of the screen, at higher memory, and inverse characters go to the top. Different results occur if BLS is replaced with BLE (Branch if Less or Equal). BLE is a signed comparison in which -128 ($80) is the lowest possible single-byte number and +127 ($7F) is the highest. In this case, graphics blocks go to the top of the screen, since they are all negative numbers accoring to twos complement arithmatic.

Using BHS (Branch if Higher or Same) or BGE (Branch if Greater than or Equal) will result in a sort in a descending order, respectively signed and unsigned. BASIC users can POKE 3015 with the numbers 47, 36 or 42 to observe the different sorting orders.

One of the main disadvantages of the bubble sort method can be easily seen by typing in the command line: CLS: POKE 1535,0: EXEC 3000. This sets the entire screen to spaces except for the last position, which contains a reverse-image "at" sign. In order to put that one out-of-place byte into its proper position, the sort must make 512 passes: including 511 passes to knock the reverse "at" back once each time and the final pass in which no switches are made. This is called a worse-case demonstration.

You can also do side-by-side comparisons with the speed that BASIC can provide. Listing 3 is a BASIC program that does the same thing as the machine code, in pretty much the same way. The difference in execution time is amazing.

Listing 3

```
0 'LISTING 3
10 FOR X= 1024 TO 1534
20 A=PEEK(X): B=PEEK(X+1)
30 IF A>B THEN POKE X,B: POKE X+
1,A: C=1
40 NEXT
50 IF C><0 THEN C=0: GOTO10
```

Array Structure

The first step involved in sorting a Color Basic array lies in discovering how the data is structured. Memory locations 29 and 30 hold the address of the start of the array storage space. If we first type DIM A(10), then Figure 1 shows what the first part of the array would look like.

The first two bytes hold the array's name. If, as in this example, the array name is a single letter, then the second byte will be equal to zero. The first is 65, which is the ASCII value for the letter "A". The next two bytes hold the length of the entire array, including all of this descriptive information as well as the actual data. The next byte holds the number of dimensions in the array (in this case, 1); and the next two bytes hold the number of elements in the array.

The data follows after that, with five bytes of storage devoted to each element. That gives us the seven bytes of descriptive information plus five bytes by 11 elements for an array length of 62. Everything checks out so far.

If we had used DIM A(3,4,5) instead, then things look a little bit different. The second part of Figure 1 contains the format. The byte which shows the number of dimensions is now, of course, three. After that, there are two bytes for each dimension, showing the size of each. All of this information can be used to mathematically compute the actual position of any element in the array. But, that's enough about multi-dimensional arrays, since this sort won't handle them anyway.

Next comes the data itself. Its not immediately recognizable because it is stored in floating point arithmatic. That is the old standard scientific notation, as in 2.14E+3, which is the same as 2.14×10^3, which—as anyone with a Color Computer can readily tell you—is the same as 2140.

—Continued on Page 14

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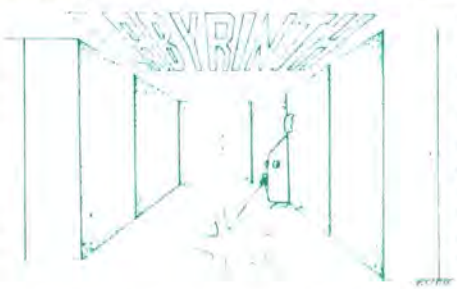

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Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

CIRCLE WORLD by Bob Anderson — The Alien culture has built a huge world in the shape of a ring circling their sun. They left behind some strange creatures and a lot of advanced technology. Unfortunately, the world is headed for destruction and it is your job to save it before it plunges into the sun!

Editors note to players — In keeping with the large scale of Circle World, the author wrote a very large adventure. It has a lot of rooms and a lot of objects in them. It is a very convoluted, very complex adventure. One of our largest. Not available on OSI.

HAUNTED HOUSE by Bob Anderson — This one is for the kids. The house has ghosts, goblins, vampires and treasures — and problems designed for the 8 to 13 year old. This is a real adventure and does require some thinking and problem solving — but only for kids.

Authors note to players — This one was fun to write. The vocabulary and characters were designed for younger players and lots of things happen when they give the computer commands. This one teaches logical thought, mapping skills, and creativity while keeping their interest.

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Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

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Authors note to players — This one feels good. Not only is it designed for the younger set (see note on Haunted House), but it also plays nicely. Instead of killing, you have to save lives to win this one. The player must help others first if he/she is to survive — I like that.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

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Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

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TRS-80 COLOR SINCLAIR OSI VIC-20

ML SORTS — from Page 10

Of course, in the 80C, it is all done in binary powers, not in decimal. But there is no need to go into all of that—you don't have to do the conversions back and forth. As it turns out (after a little experimentation), these types of numbers can be sorted just as if they were "regular" five-byte binary numbers. Well, almost.

I say almost because there is this problem in differentiating negative numbers. It is not a simple case of twos complements, and the most signbificant bit of the number doesn't give a clue. But, and this is a big but, the sign bit (that is, bit number 7) of the *second* most significant byte does tell you all you need to know. Determining the sign of the data element then becomes a simple matter. If index Register U points to the start of the five-byte element, then TST 1,U following by a BMI instruction will make the necessary test. A positive number could look like $82 00 00 00 00 (which is a 2 in decimal) and a negative number would be like $82 80 00 00 00 (which is a -2). The only difference is that one bit.

On With The Sort

The hardest part of all this was figuring out just how the data was stored. With that out of the way, how do you go about comparing one five-byte number with another?

On first thought, the answer would be to compare one byte at a time. The first byte of array element A could be compared to the first byte of array element B. If the results of the compare showed A to be greater, then the two elements would be switched by our bubble sort. On the other hand, if the first byte of A were lower than the first byte of B, we could move to the next pair since no switch would take place.

But if the bytes from A and B were found to be equal, then the comparison would be carried down to the next deeper level, and so on down the line. Finally, if the fifth bytes were found to be equal, then the entire numbers would be equal. In that instance, no switch would occur. Otherwise, that pair of equals would be switched again on the next pass, and forever after—just flipping back and forth. The sort would never end.

But such a scheme would fail to take advantage of the 16-bit instructions available with the 6809 microprocessor which our 80C uses. A sort should be fast, and so, in the interest of speed, those 16-bit instructions can and should be used. We can compare one byte, then two, and then two again, giving a maximum of three comparisons per pair instead of five.

We still have to get back to the problem of dealing with negative numbers. As I mentioned before, the instruction set provides as easy way to test for sign—by using an index register with an offset. It is naturally true that any positive number is greater than any negative number and vice versa.

Comparisions between two elements of opposite signs are, therefore, made only on the basis of their signs, not on their values. However, if both array elements being compared are negative, then the tests must be inverted. That is because a large negative number (for example -99,000) "looks" as if it is greater than -9 when, in fact, it is not. If the comparison on two negative numbers were not treated as a special case, they would all be in reverse order when the sort is done.

The results of all this are shown in Listing 4. This program is also relocatable and since most of the work is done with the registers anyway, it only required using PCR notation on a few lines here and there. The approach is the same as in the screen sort program, with two major differences.

The first is that the array to be sorted must first be found in the array storage space. An index register is first set to point to the start of the arrays. If the first name checked is not the correct one, then all the program has to do is add the

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length of the array to the index so that it will then point to the start of the next array, and so on. If the named array is not found in present memory, then the error message *ARRAY NOT FOUND is printed on the screen. If the array is not single-dimensional, then another appropriate error message is displayed.

Listing 4

```
0001 0600                NAM ARRYSORT


                 *FIRST LOCATE THE CORRECT ARRAY
                 *BY COMPARING NAMES

0002 0600        INTCNV EQU $B3ED

0003 0600 BDB3ED START  JSR INTCNV
0004 0603 F706CF        STB NAME
0005 0606 DE1D          LDU 29          *START OF ARRAYS
0006 0608 ECC4   L1     LDD ,U          *GET NAME
0007 060A 270D          BEQ NOGOT
0008 060C 10A38D00BE    CMPD NAME,PCR
0009 0611 273F          BEQ SORT        *FOUND A MATCH
0010 0613 EC42          LDD 2,U         *GET LENGTH
0011 0615 33CB          LEAU D,U        *GET NEXT ARRAY
0012 0617 20EF          BRA L1          *TRY AGAIN

                 *DISPLAY MESSAGE IF NOT FOUND

0013 0619 308D000A NOGOT  LEAX MESS1,PCR
0014 061D A680     LOOP   LDA ,X+
0015 061F 2705            BEQ DONE
0016 0621 BDA30A          JSR $A30A       *OUTPUT CHAR
0017 0624 20F7            BRA LOOP
0018 0626 39       DONE   RTS             *BACK TO BASIC

0019 0627 2A41525241 MESS1 FCC /*ARRAY NOT FOUND
0020 0637 0D00             FCB 13,0
0021 0639 2A4D554C54 MESS2 FCC /*MULTI-DIMENSIONAL
0022 064B 0D00             FCB 13,0


                 **********************************

                 *THIS SECTION PERFORMS THE SORT


0023 064D 00       FLAG   FCB 0           *FOR SWITCHES
0024 064E 0000     ARBEG  FDB 0           *ADD OF 1ST
                   *                *ELEMENT
0025 0650 0000     AREND  FDB 0           *ADD OF 2ND TO
                   *                *LAST ELEMENT

0026 0652 EC42     SORT   LDD 2,U         *GET LENGTH
0027 0654 30CB            LEAX D,U        *GET END
0028 0656 301B            LEAX -5,X       *NEXT TO LAST
0029 0658 AF8CF5          STX AREND,PCR
```

—Continued on Next Page

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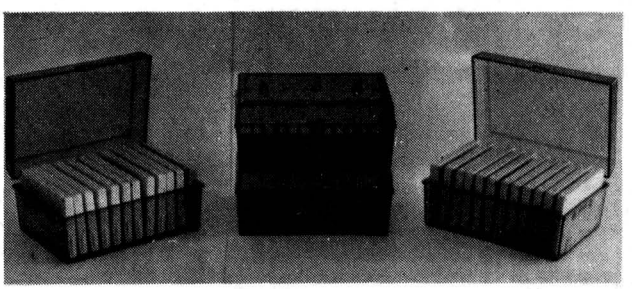

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ML SORTS — from Page 15

```
0030 065B 3344          LEAU 4,U
0031 065D A6C0          LDA ,U+         *GET # OF DIM
0032 065F 8101          CMPA #1
0033 0661 2705          BEQ OK
0034 0663 308CD3        LEAX MESS2,PCR
0035 0666 20B5          BRA LOOP        *MULTI ARRAY
0036 0668 48      OK    ASLA            *DOUBLE IT
0037 0669 33C6          LEAU A,U        *START OF ARRAY
0038 066B EF8CE0        STU ARBEG,PCR
0039 066E C601          LDB #1
0040 0670 E78CDA        STB FLAG,PCR
0041 0673 3732    TEST  PULU A,X,Y
0042 0675 6D5C          TST -4,U
0043 0677 2B3F          BMI MINUS       *1ST IS NEG
0044 0679 6D41          TST 1,U
0045 067B 2B13          BMI SWITCH      *2ND IS NEG
0046 067D A1C4          CMPA ,U         *BOTH ARE PLUS
0047 067F 220F          BHI SWITCH
0048 0681 251E          BLO NEXT
0049 0683 AC41          CMPX 1,U
0050 0685 2209          BHI SWITCH
0051 0687 2518          BLO NEXT
0052 0689 10AC43        CMPY 3,U
0053 068C 2202          BHI SWITCH
0054 068E 2011          BRA NEXT

                  *EXCHANGE ENTRIES

0055 0690 3432    SWITCH PSHS A,X,Y     *SAVE 1ST ELEM
0056 0692 3732          PULU A,X,Y      *GET 2ND ELEM
0057 0694 335B          LEAU -5,U
0058 0696 3632          PSHU A,X,Y      *SWITCH 2ND
0059 0698 3532          PULS A,X,Y
0060 069A 334A          LEAU 10,U
0061 069C 3632          PSHU A,X,Y      *SWITCH 1ST
0062 069E 6F8CAC        CLR FLAG,PCR

                  *TEST FOR END OF ARRAY

0063 06A1 11A38CAB NEXT CMPU AREND,PCR
0064 06A5 25CC          BLO TEST
0065 06A7 7C0400        INC 1024        *PASS IS DONE
0066 06AA 6D8CA0        TST FLAG,PCR
0067 06AD 2608          BNE OUT         *SORT IS DONE
0068 06AF 6C8C9B        INC FLAG,PCR    *FLAG=1
0069 06B2 EE8C99        LDU ARBEG,PCR
0070 06B5 20BC          BRA TEST
0071 06B7 39      OUT   RTS

                  *COME HERE IF FIRST ELEMENT
                  *IS A NEGATIVE NUMBER

0072 06B8 6D41    MINUS TST 1,U
0073 06BA 2AE5          BPL NEXT        *2ND IS PLUS
0074 06BC A1C4          CMPA ,U         *2ND IS NEG
0075 06BE 22E1          BHI NEXT
0076 06C0 25CE          BLO SWITCH
0077 06C2 AC41          CMPX 1,U
0078 06C4 22DB          BHI NEXT
0079 06C6 25C8          BLO SWITCH
0080 06C8 10AC43        CMPY 3,U
0081 06CB 25C3          BLO SWITCH
0082 06CD 20D2          BRA NEXT

0083 06CF 41      NAME  FCC /A
0084 06D0 00            FCB 0

0085 06D1               END
```

The second difference is the fact that we are dealing with five-byte numbers, and that is where the U Register (the User stack pointer) comes in very handily. With it, you can push or pull all five bytes at a time, which saves on both program memory and execution time. This is very useful initially in loading the five bytes into registers (A, X and Y) so that they can be used for the compare.

Remember that which bytes go into which register is determined by the "stacking order"—a predetermined sequence. In other words, the instructions PULU A,X,Y and PULU X,Y,A may look different in the source form, but they assemble exactly the same and execute in the same order with A always being pulled first. Using the U Register also shortens the segment which performs the switch of the two elements.

Once the program is assembled and in memory, it is called by using the USR command. I do not have Extended Basic in my 80C, so I could not use the VARPTR statement. That meant having to come up with a way to pass the array's name

—Continued on Page 18

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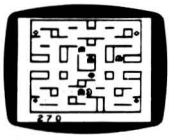

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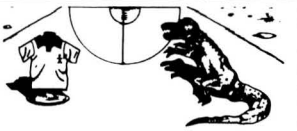

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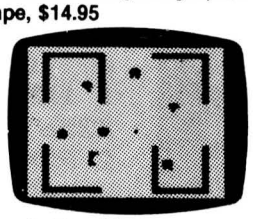

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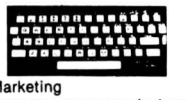

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ML SORTS — from Page 16

to the subroutine. I made a compromise in that only arrays with a single letter name can be identified.

With this convention, the second character in an array with a two-letter name is ignored, so that a call to sort array AB would result in a sort of the first array whose name started with an A. It is admittedly not the best solution, but it'll do. You specify the array to be sorted by the formula D=USR(ASC("F")) in order to sort array F. The D is just the "dummy arguement" which is required by BASIC syntax. I would imagine that someone with Extended Basic could just eliminate the first part of the subroutine (the part which locates the array) and use something like D=USR(VARPTR(F)) instead; and that would allow for using two-letter names as well.

Testing

As long as we have gone this far, we might as well test the whole thing out. Listing 5 is a BASIC program which will create and charge two arrays with random numbers, alternately positive and negative. But first it asks for the entry address of the sort routine, and sets the USR call accordingly. Extended Basic would use DEFUSR instead.

Listing 5

```
0 ' LISTING 5
1 INPUT "ENTRY POINT";X: Y=INT(X
/256)
2 POKE 275,Y: POKE 276,X-256*Y
3 L=200
5 DIM A(L),B(L)
7 SN=1
10 FOR X=0 TO L
20 A(X)=(RND(1E+8)+RND(0))*SN
30 B(X)=1/A(X)
40 SN=-SN
50 NEXT
100 FOR X=0 TO L
110 PRINTA(X);:PRINTTAB(15)B(X)
120 NEXT
200 INPUT "ARRAY";Z$
210 D=USR(ASC(Z$))
220 GOTO 100
```

The entry point is the first byte of the sort program, so if you assembled at 16175, then input that address (the code is 209 bytes long). The first array is filled with large numbers and the second with very small ones. It lists them side by side on the screen, and then asks which array, A or B, you want sorted.

When the subroutine is called, it increments the first position in video memory once for each pass through the array. This is done just as a way of letting you know that something is going on inside that little silver box and that the program is not hung up somewhere. You can eliminate that by deleting the instruction INC 1024 in Listing 4. When the sort is done, BASIC will regain control and list the arrays again, but this time the array you asked to be sorted will be in the correct order.

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The variable L in Line 3 of Listing 5 is used as a way of easily altering the length of the arrays so that you can try out different sizes. A 200 element random array takes about three seconds to sort. One-thousand elements take something like 80 seconds and 3000 elements will be done in about 13 minutes.

Obviously, as the length of the arrays increase, so does the sorting time. And it will rise dramatically. There are other sorting mechanisms which outperform the bubble sort on large arrays, but think of this: If you were using a BASIC sort instead, you could start it up and then go on vacation. When you came back, it would just be finishing up.

Well, sort of.

DIMA (10) 65 0 0 62 1 0 11 Data Follows
DIMA (3,4,5) 65 0 2 99 3 0 6 0 5

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By William Boston

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Also note Lines 43-46 and 48-49 are for your own name, address and other information. Just enter the applicable information in those Lines as indicated.

The Listing:

```
1 CLS:X=0
2 INPUT "DATE";D$
3 INPUT "COMPANY NAME";A$
```

—Continued on Next Page

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DEALER INQUIRIES INVITED

ORDERS — from Page 19

```
4 INPUT "COMPANY STREET ADDRESS"
;B$
5 INPUT "CITY AND STATE";C$
6 CLS
7 INPUT "QUANTITY";Q(1,X)
8 IF Q(1,X)=0 THEN 14
9 INPUT "DESCRIPTION";D$(1,X)
10 INPUT "PRICE EACH";P(1,X)
11 T(1,X)=Q(1,X)*P(1,X)
12 X=X+1:N=X
13 GOTO6
14 INPUT "SHIPPING COST";SH
15 INPUT "(1) CHECK OR (2) CHARG
E";CC
16 CLS:X=0
17 PRINT #-2,TAB(50)D$
18 PRINT #-2,TAB(5)A$
19 PRINT #-2,TAB(5)B$
20 PRINT #-2,TAB(5)C$
21 PRINT#-2:PRINT#-2:PRINT#-2,TA
B(5)"DEAR SIRS:":PRINT#-2:PRINT#
-2
22 PRINT #-2,TAB(5)"PLEASE SHIP
THE ITEMS LISTED AS SOON AS POSS
IBLE. I SAW YOUR":PRINT#-2,"ADVE
RTISMENT IN THE RAINBOW MAGAZINE
. I HAVE A TRS-80 COLOR COMPUTER
."
23 PRINT#-2
24 PRINT#-2,"     QUANTITY   DES
CRIPTION         UNIT PRICE
 TOTAL PRICE"
25 PRINT#-2
26 F$="      ###     %
   %        $$#####.##       $$##
#####.##"
27 FOR Z=1 TO N
28 PRINT#-2,USINGF$;Q(1,X);D$(1,
X);P(1,X);T(1,X)
29 TT=TT+T(1,X)
30 X=X+1
31 NEXT Z
32 PRINT#-2,TAB(54)"---------"
33 TP$="$$######.##"
34 PRINT#-2,TAB(42)"TOTAL      "
;:PRINT#-2,USINGTP$;TT
35 IF SH=0 THEN 39
36 PRINT#-2,TAB(42)"SHIPPING   "
;:PRINT#-2,USINGTP$;SH
37 TS=TT+SH
38 PRINT#-2,TAB(42)"GRAND TOTAL"
;:PRINT#-2,USINGTP$;TS
39 IF CC=2 THEN 48
40 PRINT#-2,TAB(5)"I AM ENCLOSIN
G A CHECK TO COVER THE AMOUNT."
41 PRINT#-2:PRINT#-2:PRINT#-2,TA
B(5)"THANK YOU"
42 PRINT#-2:PRINT#-2:PRINT#-2
43 PRINT#-2,TAB(5)"YOUR NAME"
44 PRINT#-2,TAB(5)"YOUR ADDRESS"
45 PRINT#-2,TAB(5)"YOUR CITY AND
 STATE"
46 PRINT#-2,TAB(5)"YOUR ZIP CODE
"
47 END
48 PRINT#-2:PRINT#-2:PRINT#-2,TA
B(5)"CREDIT CARD TYPE AND NUMBER
":'ADD YOUR PERSONAL INFO
49 PRINT#-2,TAB(13)"EXP DATE OR
BANK #":'ADD YOUR INFORMATION
50 GOTO 41
```


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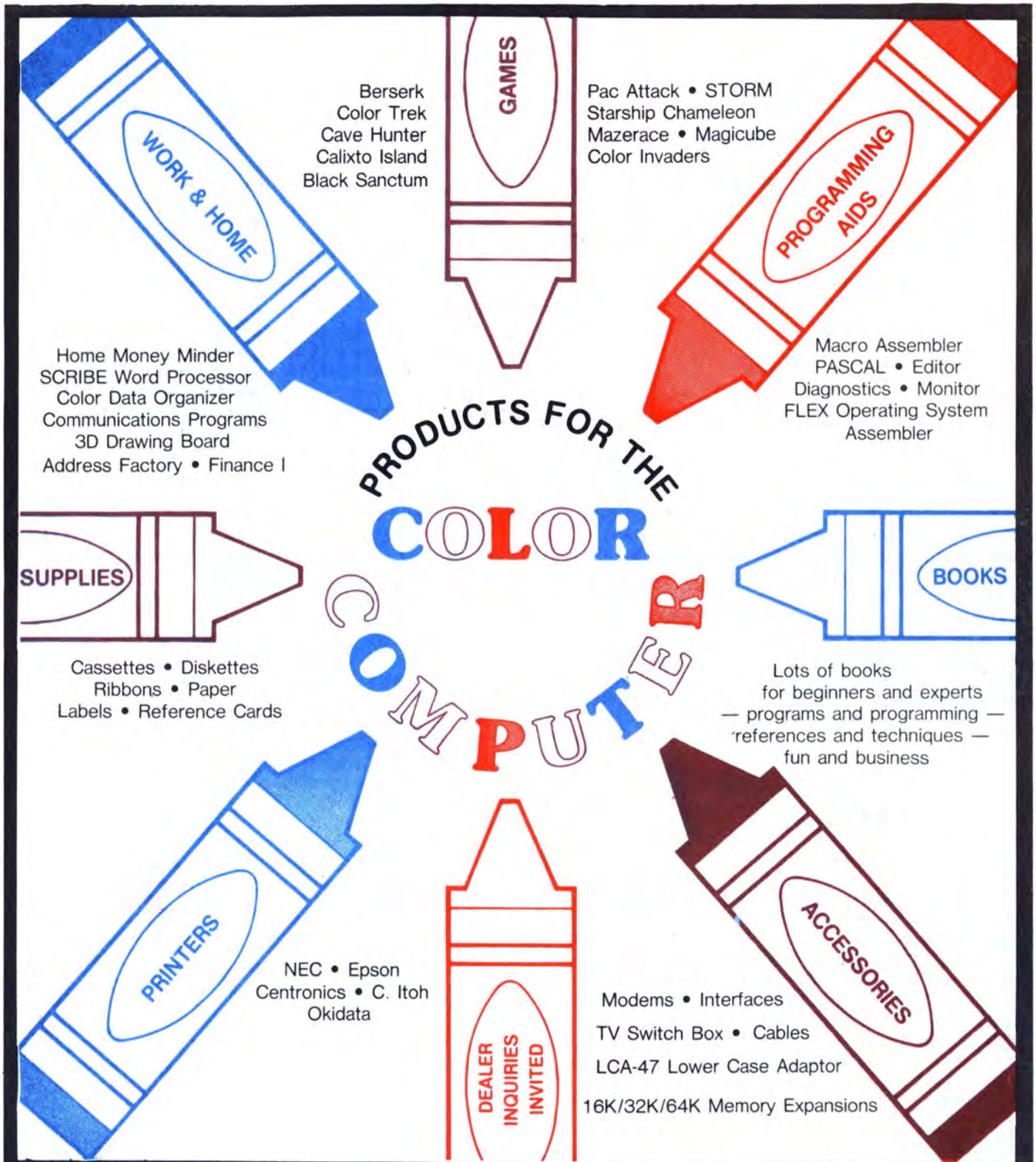

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By Dennis S. Lewandowski
Rainbow Columnist

(Mr. Lewandowski, an experienced assembly language programmer and teacher, is the president of DSL Computer Products.)

Last month we kind of went short on talk and long on listing. The program included in last month's article was a lot more than just a sample of indexed addressing. It was a complete machine language program, as opposed to a subroutine or demonstration of a specific function.

This time out we're going to take a little time to discuss some of the things the program from July's issue does. So, get the listing and let's go.

The first four lines are EQUates. This means I wanted to use certain memory locations for data storage, so I EQUated them to a LABEL. The first real instruction, labeled START, is just a ROM subroutine to clear the screen. (By the way, the ROM subroutine does use indexed addressing as well.) Then, we make sure there is a zero in Register A so we can store it in memory location COUNT. Next, we display the "prompts"—or output the messages to the screen.

Notice how each time we need an input we use the same subroutine? Why write three different subroutines? Just store the data in different places. That is what is being done just after we return from the subroutine. Is this the *right* way to do it? That is up to you. *If* writing three different subroutines is what works for you, then that is the *right* way for you. There is no right or wrong. Just what works and what doesn't.

Now, let's consider what is being done with the label SPC. Here is an example of a "self-modifying" program. The instruction before it is FCB, or Form Constant Byte, which is a method of putting a hexidecimal number at that memory location. The number chosen was $C1, which just happens to be the opcode for CMPB. Compare B to what? The label SPC is set to zero on assembly of the program, however, once we have the search byte we store it *in* our program. When the CPU executes these instructions, it doesn't really care how they got there.

We do the same thing again, three lines later, except this time we use FDB, Form Double Byte, and use hex $108C. This is the opcode for CMPY. If we put in CMPY, the assembler would think we made an error and assemble it as a NOP. The label SEND, or search END, is also set to zero at time of assembly and set to the desired value by the program.

So, are the other two pages of program just to get user input? No, there is another place where we use indexed addressing. Can you find it?

How about OUTA? What's happening here is the pointer, X, is set by loading the desired message location. Then we branch, or jump, to the OUTA subroutine, and use indexed addressing to place the message on the video screen. I picked a zero as the "terminator" in this routine. So, each message must end with a zero. If not, the routine will keep printing anything it finds on the screen until it eventually finds a zero. The $0D preceeding the zero is a carriage return. This tells the video routine ($A30A) to finish that line and start a new one.

If you haven't noticed by now, I have introduced you to the wonderful world of "compares." There are 22 times when the program must make a decision. By using "compare," or "branch if," instructions, we get the program to do what we wish.

Let's follow an input and see what happens. The first occurrence of an input is at Line 13 (Line numbers are the ones on the far left of the listing). Here, we branch to a subroutine called INFOUR, cleverly named (by me) due to the need for four keypresses.

INFOUR (at Line 38) starts by branching to another routine, INHEX. INHEX then jumps to a routine in ROM, which simulates the INKEY$ of BASIC, complete with flashing cursor. This routine will repeat until there is a keypress, so there is no need to loop. The hex value of the keypress is stored in the A Register.

The first thing that is done with the keypress is to see if it is less than an ASCII zero. If it is, we branch to the error routine called WHAT. Next it is checked against an ASCII nine. If it is greater, we branch to ALPHA, or we continue processing it by branching to OUT1. Sounds like an IF, THEN, ELSE statement in Basic, doesn't it?

Let's assume the keypress was the letter B, and continue to

—Continued on Page 24

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ASSEMBLY — from Page 22

ALPHA. Again we compare it to an ASCII A. If it was greater than nine but less than A we would branch to our error routine. Now we compare it to X, our escape button. No, still, O.K., keep going. Finally, we compare it to F. Since the ASCII value of B is less than the ASCII value of F, we "fall through" into the routine OUT1. Where would we have branched if our keypress had been between 0 and 9?

At OUT1, the keypress is displayed on the screen at the current cursor location. Next, the ASCII is stripped off, but there are still those pesky seven characters between 9 and A. So, since our keypress is B, we have to subtract seven more to get what we need.

At long last we reach DONE, which is an RTS (ReTurn from Subroutine). Where do we return to? The second line of INFOUR.

For all of our troubles, we are sent to a another subroutine, MSNHEX, Most Significant Nibble HEX (If you don't remember what a Nibble is, get the April '82 *Rainbow*).

Here all we do is clear the carry flag by clearing the B Register. And rotate the A Register "through" the carry flag four times. Now the Least Significant Nibble is the Most Significant Nibble. Yes, I could have used the LSL instruction. However, the object of this series is to get as much exposure to programming concepts as possible.

The RTS now puts us at line three of INFOUR (Line 40). Here we are storing the "conditioned" data in a memory location called VAR, short for variable.

Now, that seems to have taken a lot of explaination for three lines, but look at what the next instruction is. That's right, branch to INHEX again! This is one of the convenient features of machine language programming. Just write a routine to perform one function and then call (branch or jump) to it whenever you need it.

At this point I'd like to offer a suggestion. Start a folder or notebook of machine language routines. Then, when the occasion arises, all you have to do is select one—rather than rewrite and debug a new one.

Well, back to the salt mines. At Line 42 we OR A with the memory location VAR. Why? Well, we stored the MSN at VAR, so now the A Register contains the LSN. Once ORed, the contents of VAR and the A Register are "combined." This forms the first complete byte of the starting address.

If we assume the second keypress was a 3, the A Register would contain $03. The memory location VAR contais $B0. Upon completion of the ORA instruction, the A Register now contains $B3, since any number combined with a zero will equal that number.

No, we didn't add the numbers, we ORed them. We will get into this type of math in a later article.

Now, since the A Register contains $B3, what is in VAR? Still $03, of course. So the next instruction stores the first byte back at VAR.

The routine starting at Line 44, INTWO, is basically the same. The one important exception is that the results are now stored in memory location VAR+1.

Now, think about that. Where did we EQUate VAR+1? Nowhere. Most editors will allow simple use of memory related to a label. Yes, instead of labeling the byte we use for storage SPC, we could have used STA START+59. Since START+59 is rather confusing, I chose to assign another label.

In general, if you are using the next memory location, the reuse of a label with a +1 won't cause any trouble. But be sure of when that memory location is used and be careful.

What happens if you use something like a START+59 and later add only a one byte instruction? That's right. The whole program goes out to lunch.

At the end of this routine, we load the A Register with a $0D, which is an ASCII carriage return (the same as the ENTER key). Then a jump to $A30A to print it. But how can you print an ENTER? We don't really print anything, what is output to the screen is a control code. The ROM routine will do all the screen updating for us.

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TEXT EDITOR

By John Waclo

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Finally, we come to an RTS. By now, you're unsure of where we should return to. Believe it or not, back to Line 14.

If we get confused about where to return, how does the CPU know? Well, it cheats. It uses the *stack*. Every time we go to a subroutine, the CPU pushes its current location on the stack. Every time an RTS is encountered, it will pull that address off the stack and place it in the PC (Program Counter) Register.

One word of caution. Jumping to subroutines is fine, and I encourage it. However, always be sure of where you came from and that the program will somehow be able to get back. If not, you have just given the CPU a piece of rope. What was it they did to bad programmers in the old west?

Speaking of lynching parties, if I don't explain what is happening at PRINTY, I'll probably have quite a few ropes available.

First, the Y Register is pushed on the stack. When we push a register on the stack, it is just "copied" there. The value in the register is unchanged. Next, we pull the D Register.

Say what? Its perfectly legal. What we need is the contents of Y some place so that we can "condition" it. The D Register can be added too, subtracted from, ANDed or ORed (pun intended). We can also work with the A or B Registers separately, still maintaining the values placed in D. The only problem with indexed addressing is that the Y Register is automatically incremented, so Y is pointing to the byte after the matching byte found in the search.

No problem. We decrement the B Register, which is the LSB of the D Register. Now we branch to HEXOUT, which is just HEXIN in reverse. Then we transfer A with B.

Hold it. Why didn't we just transfer Y and D? If we transferred Y and D, Y would have the contents of D placed in it. Where would Y point? I don't know, but it sure would not be where we wanted the search to restart. Again, we call HEXOUT and then, to keep it neat, we do a DBLSPC (Double Space).

Speaking of which (space that is) mine has come to an end for this month. For September, something really different. And that is all the hint you get.

If you have need of further explaination or questions about something in the listing, write me either through *the RAINBOW* or at DSL, P.O. Box 1113, Dearborn, MI 48121.

Software Review...

SASPUS Is 80C Version Of The WUMPUS Game

One of the first longer games I ever converted to the 80C was WUMPUS, probably because, primarily, the warning *"I Smell A Wumpus"* seemed interesting at the time.

I wasn't disappointed with my WUMPUS game, and you won't be either with *SASPUS*, which is an offshoot of it.

I will spare you a long explaination of the form of a dodecahedron (*"Look it up yourself and it will be yours forever"*), which is what—squashed up—makes up the form of the caves of the Wumpus (or Saspus). Each room has three possible exits, and you have to choose which one you wish to take.

Yes, Virginia, there are all sorts of creatures and pitfalls in the caverns of the *SASPUS*. Bats, poison gas and so forth. Then, there is the Saspus itself. You have to shoot it with an arrow.

This version for the 80C is fun to play and has a few added extras thrown in. We won't bother to tell you everything, that might spoil some of the intrigue.

SASPUS is a non-graphic game, that is, it deals with words rather than pictures. Nevertheless, it is a classic and we are pleased that a version is available for you to enjoy on the 80C.

(Color Software Services, P.O. Box 1723, Greenville, TX 75401, $8.95)

Hardware Review...

This Joystick Package Is First Rate

We, honestly, are lukewarm, at best, about the "official" joysticks available for the 80C. For one thing, they tend to get in the way, they are pretty light in weight and the cords get tangled up with a lot of other things.

JARB Software's new Dual Joystick Unit (*DJ*) takes care of most of these problems and offers the advantage of a better joystick operating mechanism—called a pot—to boot.

Packaged in a nice plastic case with both joysticks mounted on a sloping front, the *DJ* system makes it easier to use these indespensable game aids. And, because there is some weight to the case, the whole assembly has now found a permanent home on my computer table. Before, the light "official" joysticks just got pushed aside. In addition, *DJ*'s cables are heavier, and much less prone to tangle up. That, and the fact that I no longer need to move the joystick *per se*, means there is less clutter.

As to operation, the actual mechanism is by our friends at Radio Shack, but these pots seem to be a cut above those you get with the "official" version. And, the fire buttons are big and bright. They don't stick either. And, because the surface of the *DJ* is tilted, they are, in my view, much easier to use than the hold-in-your-hand variety.

We liked this product and have already used it to great advantage in running copies of game programs for review.

(JARB Software, 1169 Florida Street, Imperial Beach, CA 92032, $29.95 plus $4 shipping.)

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Software Review...

BASIC AID Is Fine Programming Tool

Probably the most frustrating thing about programming in BASIC is that it requires you to repeat the same commands over and over again. Now, there is help for that problem, and some other frustrating things as well.

BASIC AID, a ROM Pack which comes with a great number of features, will let you enter BASIC commands by pressing just two keys on the keyboard. For instance, if you want to enter a command such as CHR$(, all you have to press is the down arrow and the up arrow key. The down arrow acts as a "control" key that allows you to tap into most of Extended Color Basic's commands while the up arrow is the symbol for CHR$(.

This program even includes the open parentheses for those commands which require them (such as RIGHT$, LEFT$ and the like) and gives you an option of whether to have spaces between commands or not. In other words, if you want program lines in a "condensed" format to save memory, you just press a key and the commands from *BASIC AID* will be written that way.

In these respects, *BASIC AID* is very similar to the *Master Control* program which has been available for the past year or so. *BASIC AID* is on ROM, while *Master Control* is on tape. As far as things go, this is about the only difference between the programs thus far, including a keyboard overlay which both supply so that you do not have to try to remember what key the program uses to invoke a specific command.

Both programs also allow automatic line numbering, an extremely handy utility that was left out of the 80C's BASIC. That is too bad, because an automatic numbering utility is an excellent addition—particularly when you are typing in line after line of DATA statements. And, with these programs, it is even easier to do that sort of thing because they have a two-key entry for the command DATA as well.

BASIC AID has the added ability to allow you to re-define all the keys. You do have programmable key ability in *Master Control*, but you cannot re-define them all. And, *BASIC AID* will also allow you to save your re-definitions to tape, so that you can load and use them again as you wish.

Redefinition is valuable because some programs (such as Adventures, data bases and the like) often require series of IF/THEN lines, with only a small change in the variables. You could save literally hours of programming time by self-programming a few keys.

BASIC AID does not stop there. It has two other excellent utilities which, alone, make it extremely worthwhile. First, it allows cassette-based systems to merge programs (as can be done on disk) and it makes it possible to move segments of programs from one place to another.

Yes, there is a merge technique for cassette programs, but it requires some fairly extensive keyboard input and also ignores line numbers completely. Say you have a subroutine which you wish to merge into several BASIC programs. You must be sure the line numbers do not conflict with those already in the computer's memory, and you have to add in the subroutine at exactly the place you want it, taking care that the line numbers are always higher than the resident program so you can "tack it on" the end of the code already in memory.

BASIC AID also requires that you pay some attention to line numbers so they do not conflict, but it allows you to set the line numbers while making the merge, so that there is no manipulation necessary with the programs themselves. And, therefore, you really don't have to worry what the line numbers in your subroutines might be. You merely set them when you load them to anything you want.

Finally, *BASIC AID* provides a utility that many a programmer has dreamed about—the ability to move program lines in memory! Not only are the lines moved, but the references to those lines are changed as well. This, all by itself, makes *BASIC AID* an excellent buy.

The program is easy to use, the instructions are clear and concise and we could not discover a single flaw in operation. It works with all Color Computers, 4K to 32K. Of course, because it uses the ROM port, it will not work with a disk system. Yet, the time saved in programming would more than compensate the user even were he wanting to make a save to tape and then unplug *BASIC AID*, plug in the disk, and then load and transfer a tape to disk.

In a word, an excellent program and fine utility.

(Available from Spectrum Projects, 93-15 86 Drive, Woodhaven, NY 11421, $34.95)

Software Review...

BWINDO Gives A Look Into The Basic ROMs

If you really want to get into the Basic ROMs and see what is going on, *BWINDO* offers you an opportunity to do just that.

This is a special-purpose disassembler. While you can only use it for the Basic ROMs, it does an outstanding job of telling you what is there. And, because it does not need to be adaptable to any other part of the 80C's memory, it allows some conventions that would not be possible in a general purpose disassembler.

If that sounds like gibberish to some, here's what we're saying: A general purpose disassembler may have to be run

—Continued on Next Page

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BWINDO — from Page 27

several times because it never knows what it is going to be disassembling. So, you run it once, check the code closely to hunt for specific types of things, and then run it again asking for different types of output.

An example of this might be actual messages which appear as words stored in various memory locations, letter by letter. A general run of a disassembler can usually only provide output that looks like it *might be* a message. You have to run that section of the disassembly again, asking for the letters and numbers to be specifically shown. If you are right, you are rewarded with the message. If you are wrong, its usually garbage.

However, because *BWINDO* is geared only for the Basic ROMs, it knows where different types of code are formed in the first place. It makes these adjustments when doing the disassembly, and you get clear accurate code the first time with no guesswork.

That does not mean that all the Basic ROMs secrets are easy to find, but they become easier with this program, which is a powerful and easy-to-use tool for examining the machine language code.

The program comes with extensive instructions and explainations and is a good buy for the programmer who understands machine language and wishes to take a through look at the Basic ROMs. This is not a program for a beginner or one unfamiliar with machine language.

(Ron Levine Software, P.O. Box 356, Redwood City, CA 94064, (Price Not Furnished)

CORRECTIONS

In Line 1780 of the NFL, Part II, read the line as: "DATA 8, A, 26, 7, W3U, 19, 9, A, 10, 27, L8U ..." Ted Hansenstaub points out that the last entry shown is L8U, not W8U—reflecting the team's actual record.

In the Disk File programs in July, Arnold Weiss points out the following corrections and/or refinements:

Listing 1, Line 21: Change FILEREC/DAT:1 to just FILEREC/DAT

Listing 2, Add Line 5: 5 PCLEAR1

Change Line 55 to D$= "FILEREC/DAT"

Delete Lines 56 and 281

Add to Line 390: CLOSE#1: to beginning of line. Change FILEREC/SRT:1 to FILEREC/SRT

For systems with only one disk drive, make the following changes:

Listing 1:

Line 21: Change #2 to #-1

Line 259, Change #2 to #-1

Listing 2

Line 80, Change 1 to #-1

Line 110, Change EOF(1) to EOF(-1)

Line 120, Change 1 to #-1

Line 230 and 285, change FILEREC/SRT:1 to FILEREC/SRT

Line 330, Change 380 to 390

Delete Line 380

For multiple disk systems, change Line 380 to read KILL instead of "!"

For all systems which do not use an Epson printer, delete the following code in Line 300:

CHR$(27) CHR$(69) CHR$(12) and the CHR$(27) CHR$(70)

Correspondence...

Rockin' Through The ROM

By Bill Clements

Jim Dudgeon and I, both of the University of Alabama, are doing some machine language programming and are quite interested in documenting the ROM subroutines and the lower memory workspace of the 80C.

As you know, the 6502 Microsoft Basic used by the Apple, OSI, Pet and other machines is well documented. While one sees mention of the 80C ROM in articles from time to time, there doesn't seem to be a very concerted effort to tie together in one place all that is known.

It seems to us that *the RAINBOW* could offer a real service to the 80C community by acting as a clearinghouse for this information. I have put together a list of all the ROM subroutines and lower-memory use that I have been able to find through articles, manuals and the machine-language programs to which I have access.

Jim and I would like to see you publish these lists, along with a challenge to readers to work on documenting the ROMs and send in corrections or additions to whatever they find. You might consider this as a regular feature.

(Editor's Note: OK, here is the list. We'll be most willing to publish whatever anyone wishes to contribute to this effort. Please mark your contributions so we can give credit to the contributors.)

Extended BASIC RAM Work Space

Hex	*Decimal*	*Function*
19-1A	25-26	*Address of beginning of BASIC Program*
1B-1C	27-28	*Address of end of BASIC Program*
1D-1E	29-30	*Pointer to variables*
1F-20	31-32	*Pointer to start of arrays*
41-48	65-72	*Start and end address in block move (see BASIC ROM routines)*
6F	111	*Output device code (0-screen; $FE-Printer)*
72-73	114-115	*Contains $80C0 (entry address warm start of BASIC)*
74-75	116-117	*Pointer to end of memory*
7C	124	*Cassette file block type*
7D	125	*Number of data bytes in cassette I/O block*
7E-7F	126-127	*Program end address +1 after a CLOADM*
88-89	136-137	*Pointer to current cursor position*
8C	140	*Location of sound frequency*
8C	142	*Duration of sound*
92	146	*Controls length of unmodulated carrier preceeding cassette I/O*
94	148	*Cursor color*
95-96	149-150	*High- and low-order bytes of baud-rate code*
97-98	151-152	*Line delay code*
99	153	*Comma field width*
9A	154	*Last comma field*
9B	155	*Printer line width*
9C	156	*Affects positions of variables line-printed in standard comma fields*
9D-9E	157-158	*Transfer address after CLOADM*
A8-AA	168-170	*Contains 7E AA 1A (jump jump vector to $AA1A) to print OK)*
BC	188	*Contains 6 if not disk system, $E if it is*
10C-10E	268-270	*Contains 7E 89 4C (jump vector to $894C-7E D7 BC if disk)*
10F-111	271-273	*Contains 7E A0 F6 (jump vector to $A0F6)*
112-113	274-275	*High- and low-order bytes of timer*
$$6-$$9	178-281	*Seed for RND function*
11D-11F	285-287	*Contains 7E 84 89 (jump vector to $8489-print OK)*
15A-15D	346-349	*Joystick readings*
01D2-01D9	474-481	*Name of cassette file*
01E7-01E8	487-488	*Start address of program after CLOADM*
02DC	732	*Contains the token for the first keyword in a BASIC statement*
02DD-03DC	733-988	*Keyboard buffer*
601	1535	*Start of BASIC statements*

ROM Subroutines in the Color Computer's BASIC

(Addresses For Direct Entry)

$807F	*Cold start to BASIC, but without memory size search and the RAM workspace initialization. Does reset pointers to start of BASIC program.*
$80C0	*Warm start to BASIC. Does not reset pointers to start of BASIC program.*
$A027	

—Continued on Next Page

ROMs — from Page 29

$A027	*Performs the reset function (as when the RESET button is pressed)*
$A1B1	*Wait for keypress and read keyboard; character returned in A Register.*
$A1C1	*Poll keyboard for a character. Z is 1, A is 0 if no key is seen. If key is seen, Z is 0 and A is key seen. B and X preserved.*
$A282	*Output a character to device specified by the contents of $6F (0 is screen, $FE is printer). All but CC preserved.*
$A2BF	*Write character in A to printer.*
$A30A	*Write character in A to screen.*
$A390 & $A393	*Read line from keyboard into buffer at $02DD; return X+$02DC; zero byte at end of buffer*
$A46C	*Perform CSAVEM function. Requires start of memory block in $19-$1A and in $01E7-01E8, end of block in $1B-$1C, transfer address in $01E5-$01E6, and the file name in $01D2-$01D9. Enter with a 2 in A and a 0 in X.*
$A70B	*Read a block from cassette. Must be on and in bit sync. $7C contains file block type: 0 is file header, 1 is data, $FF is end of file. $7D contains number of data bytes in file (0-$FF). Z is 1, A is 0 if no errors. Z is 0, A is 1 if checksum error. Z is 0, A is 2 if memory error. X is buffer start + block length if no error, X points to beyond bad address if error. U and Y are preserved.*
$A77C	*Start cassette and get into biy sync for reading. U and Y preserved. FIRQ and IRQ masked.*
$A7DB	*Turn cassette on and write leader.*
$A7F4	*Write a block to cassette. Tape should be to speed and leader of $55's should have been written if this is the first block. $7E contains the buffer address, $7C contains the block type, $7D contains the number of data bytes. X is the buffer address, plus the number of bytes. All registers modified.*
$A928	*Clear screen and home cursor.*
$A9DE	*Sample joystick pots and store values (see **BYTE** 12/81, p. 158) Left joystick up/down is $015A, right/left is $015B; Right joystick up/down is $015C, right/left $015D. Y is preserved.*
$AC20	*Move block of memory starting at top* *$41, $42 is destination top address* *$43, $44 is Source top address* *$45, $46 is Destination bottom address after move* *$47, $48 is source bottom address*
$AD19	*Execute NEW command*
$B3ED	*Convert the number in BASIC's floating-point accumulator into a 16-bit two's complement integer, which is left in the D Register. Overflow error and return to BASIC occur if number is outside the range -32768 to +32767*
$B9AC	*Print a space*
$BDCC	*Display the decimal value in the D Register*
$C0D4	*Warm start to disk BASIC*
$D66C	*Read or write a 256-byte sector from or two disk. See disk manual pp. 60-61 for instructions.*

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They are the mutant phantoms. You are the Phantom Slayer. Enter the deadly catacombs and destroy the phantoms. Wield your laser pistol, and attend to your proximity detector. One touch by a phantom is fatal, so if your first shot fails, turn and run! Phantom Slayer is a **real-time** game executed with full-screen, **three dimensional** graphics. It features multiple difficulty levels and a training mode.

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FLEX System Is Powerful Addition To World Of 80C

By Dr. Laurence D. Preble

Frankly, I'm impressed.

Several months ago, I purchased a 16K Color Computer to use at home, mainly as something little more than to mess around with. I was not disappointed. It performs admirably as a most interesting and yet potentially powerful machine.

I was content with my system as it was until this amicable fellow fellow named Lonnie Falk handed me a couple of disk drives and something called *FLEX*. "Check it out," he said.

Wow. Suddenly I've got this strange hybrid of business computer and plaything. You see, I do have this serious side to me. I am a chiropractor. For the past two years I have used a "big" microcomputer in my office to handle various chores: Record keeping, billing, dietary analysis, word processing and so on.

I have been very happy with my "big" micro. It works hard and uses a powerful disk operating system called "FLEX." Technical Systems Consultants (TSC) wrote *FLEX*. Data-Comp distributes the operating system conversion of *FLEX* that I used with the 80C.

FLEX is neat. With it I can read or write diskettes formatted in a number of different ways: single- or double-sided, single- or double-density; *FLEX* takes care of the details automatically.

FLEX is economical with disk space. Those of you familiar with Radio Shack's disk operating system for the 80C know that disk storage is divided into granules. *FLEX* divides disk storage into sectors. A sector is a much smaller chunk of disk storage than a granule.

With the Radio Shack system, every data file or program has to occupy at least one granule. If the data you enter does not fill up the entire granule, then whatever is left over is wasted. Since *FLEX* uses much smaller chunks of disk storage, less space is wasted if one of these "chunks" is not filled completely.

FLEX has been around for years now, used with a multitude of 6809 and 6800 mainframes. There is an enormous amount of software written to run under the *FLEX* operating system. Virtually *all* of that software can now be run on the Color Computer.

A small sample of that software includes an excellent and extremely fast Extended BASIC, "C," Pascal, and Forth compilers, numerous word processing programs, spelling checkers, "VisiCalc® type" programs, assemblers and editors. Control keys and user-defined keys are available.

By the way, you give up none of the fine Radio Shack features. With this implementation of *FLEX*, whenever you want it, the normal Radio Shack Disk system is available for use.

"Yes," I hear you say. "But how can I do *really* serious work on a Color Computer with that limited 32x16 character display?"

Well, Data-Comp has taken care of that. They have a *FLEX* utility that lets you format the screen virtually any way you want. You can have 32x24, 42x24, 51x24 or 64x24 characters/lines in a screen. Admittedly, 64x24 is a little difficult to read on most TV screens. But, as a bonus, you get a full lower case.

Data-Comp does this much the same way some of the non-*FLEX* software available for our friendly 80C has—by using the high resolution graphic screen. Thus, no extra hardware is needed for the special display formats.

It is not fair to say that there is ***no*** hardware modification needed. It is necessary to add memory. Obviously, you must also purchase at least one disk drive and a Radio Shack disk controller. Radio Shack disk drives work fine.

Also, the Basic ROM must be the 1.1 version chip in order to run *FLEX*. This is not so bad, really, and a number of firms (check *the RAINBOW's* ads) have 64K chips available. You have to do some soldering. Other companies will do the installation for you. Or, your "official" 32K Radio Shack upgrade *may* actually be made with 64K chips. As to *FLEX* itself, Data-Comp will sell you their F-MATE(RS) FLEX9 conversion and TSC's *FLEX* as a package for just under $200. Data-Comp also includes TSC's editor and assembler, which normally sell for $50 each.

Since I have been using *FLEX* for quite some time, I looked hard to see whether I could find any serious flaws in the system as provided. I did not find any major problems. Installation instructions were not difficult to comprehend. I would like Data-Comp to add one feature that I feel would be invaluable—a patch to the Radio Shack Extended Basic so that disk files in the *FLEX* format can be used interchangeably with the normal Radio Shack files.

There is one disturbing aspect of this Color Computer enhancement: My "big" computer does not seem so big any more.

My "big" computer system cost several thousands of dollars and included 56K of memory for almost $1000. My friendly "little" 80C now has 64K of Random Access Memory and 24K of ROM for a total of 88K. The extra

What's A FLEX Anyway

One of the things readers have asked a great deal about is FLEX, and we attempt to give you an overview with the two articles here. Dr. Preble has been running FLEX on a mainframe system for years, and gives the "official" review of this system. Lonnie Falk, far from a hardware whiz, adds a short rundown on what it takes to get FLEX "plugged in." Our coverage of this system will continue in September with a special article written by Steve Odneal, who authored the documentation for Data-Comp's FLEX conversion. We also plan at least one review of a FLEX Basic.

We see FLEX as a significant and compatable additional system to your Radio Shack disk and will continue to provide information and reviews of the hardware and software which is available for it.

memory cost 1/10th of what I paid for in my other system. It just isn't fair!

The "little" 80C can now do just about anthing the "big" system can—and when it is done working, I can still play *ASTRO BLAST.*

(Data-Comp, 5900 Cassandra Smith Road, Hixon, TN 37343-0794, $49.95. Operating system available from Technical Systems Consultants, 111 Providence Rd., Chapel Hill, NC 27514, $150. Packages also available from Frank Hogg Laboratory, 130 Midtown Plaze, Syracuse, NY $3210)

Hardware Review...

64K Upgrade Takes A Bit Of Know-How

Those of you who have followed these pages know that I am not what you would call a hardware whiz. I'll admit to having some real help with the installation of the 64K chips and modification needed to get FLEX up and going.

We won't go into the details, because anyone who is selling 64K chips will furnish you with instructions on exactly how to do it. But, we will say that it takes some amount of ability with a soldering iron (*not* gun) to do this.

Even if you have a Radio Shack upgrade to 32K that has "good" 64K chips, you still need some modifications to use the full 64K. This is where the soldering comes in. If you don't have 64K chips, you have to purchase them, remove the chips you have, and put in the new ones. You also must have a 1.1 ROM, which Radio Shack furnishes if you have their upgrade to 32K.

Doing the chips is easy, if you are careful. You can use a nail file or flat blade screwdriver to wiggle the old chips out. If I can do it, you can. Really.

But the other part of this modification requires some expertise with the old soldering iron. You have to run a couple of wires from one pin of one chip to another pin of another. Its the sort of thing that—like laying carpet—looks real easy when someone does it who knows what he or she is doing.

If you do, then, by all means, attempt it if you want to try this upgrade. If you don't have this ability, there are a number of people who will do it for you through the mail—or you can certainly try someone locally. Most of the computer stores which carry *the RAINBOW* have a someone who can handle this sort of thing.

We feel it imperative to tell you that opening the computer cabinet voids your Radio Shack warranty. With that knowledge, you can decide whether you want to attempt this modification yourself or not.

You *can* zap a chip by either heat or static. Too, you have to be very careful not to get solder in the wrong places. In short, if you do not have confidence in your ability to handle some moderately intricate soldering, have someone else do it for you!

Look For The. . . . .

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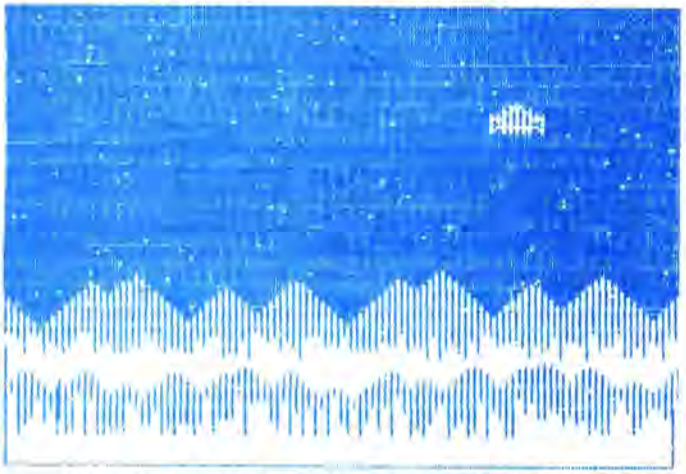
The program is self-prompting in that you need only load and run it to see the directions.

Will the alien saucer annoy your colonists? Or can you keep it away? Here, then, is *ALPINE ALIENS* for you to decide.

The Listing:



```
10 CLEAR500:CLS0
20 P$=CHR$(128):FORI=2TO14:FORJ=
4TO13:SET(J,I,3):NEXTJ:NEXTI
30 FORK=0TO11STEP11:FORJ=18TO23:
SET(J+K,2,3):NEXTJ:FORJ=17TO24:S
ET(J+K,3,3):NEXTJ:FORI=4TO14:FOR
J=16TO25:SET(J+K,I,3):NEXTJ:NEXT
I:NEXTK
40 FORK=0TO7STEP7:FORJ=39TO58:FO
RI=2TO7:SET(J,I+K,3):NEXTI:NEXTJ
:FORI=3TO6:SET(59,I+K,3):NEXTI:F
ORI=4TO5:SET(60,I+K,3):NEXTI:NEX
TK
50 PRINT@321,P$;:FORY=1TO28:READ
A:PRINTCHR$(A);:NEXT
60 DATA 105,108,108,117,115,116,
114,97,116,101,100,128,128,128,1
09,101,109,111,114,121,128,128,1
28,98,97,110,107,115
70 PRINT@393,P$;:FORY=1TO12:READ
A:PRINTCHR$(A);:NEXT
```

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tuvwxyz{|}

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```
80 DATA 98,111,110,117,115,128,1
28,128,103,97,109,101
90 DIMA(13), B(4):G=0:FORI=33TO2
25STEP16:G=G+1:A(G)=I:NEXTI:G=0:
FORI=26TO74STEP16:G=G+1:B(G)=I:N
EXTI
100 PMODE3,1:PCLS:SCREEN0,1
110 M$="E12F16E17F5E8F17E12F9"
120 N$="F11E8R2F10E9"
130 O$="E15R2F5"
140 SA$="L3GU3FUFD2U4FND3UEND5FN
D4DED4U2EDED3HL3"
150 SP$="C5"+SA$:SE$="C0"+SA$
160 DRAW"S4BM0,110;C3"+M$+M$+M$
170 PAINT(4,112),3,3
180 CLS0:PRINT@109,CHR$(97)+CHR$
(108)+CHR$(112)+CHR$(105)+CHR$(1
10)+CHR$(101);
190 PRINT@173,CHR$(97)+CHR$(108)
+CHR$(105)+CHR$(101)+CHR$(110)+C
HR$(115);
200 PRINT@239,CHR$(98)+CHR$(121)
;
210 PRINT@298,CHR$(102)+CHR$(114
)+CHR$(101)+CHR$(100)+P$+P$+CHR$
(115)+CHR$(99)+CHR$(101)+CHR$(11
4)+CHR$(98)+CHR$(111);
220 FORI=0TO256STEP2:LINE(I,124-
RND(10))-(I,140),PRESET:NEXT
230 PAINT(2,140),4,3
240 DRAW"S2BM0,134;C2"+M$+N$+M$+
N$+O$+N$+M$+N$+O$+O$+M$+N$
250 CLS0:FORY=1TO86:READA:POKE11
51+Y,A:NEXTY
260 DATA 20,15,32,2,12,1,19,20,3
2,20
270 DATA 8,5,32,1,12,9,5,14,19,4
4,32
280 DATA 16,18,5,19,19,32,35,49,
32,20,15
290 DATA 19,8,15,15,20,32,12,5,6
,20,44
300 DATA 32,35,50,32,20,15,32,19
,8,15,15
310 DATA 20,32,3,5,14,20,5,18,44
,32
320 DATA1,14,4,32,35,51,32,20,15
,32
330 DATA19,8,15,15,20,32,18,9,7,
8,20,46
340 PAINT(2,140),2,2
350 LINE(0,150)-(256,192),PRESET
,BF
360 PMODE4,1:SCREEN0,1
370 FORI=1TO200:PSET(RND(256),RN
D(150)):NEXT
380 LINE(0,150)-(256,192),PSET,B
F
390 FORI=2TO256STEP2:LINE(I,156-
RND(20))-(I,192),PSET:NEXT
```

—Continued on Page 37

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ALIENS — from Page 35

```
400 LINE(0,0)-(256,160),PRESET,B
410 SCREEN1,1
420 TIMER=0:GOSUB490
430 GOSUB490:DRAW"S8BM"+X$+"C0"+
SE$:DRAW"BM"+A$+SP$
440 IFDB=>10THEN560
450 FORI=1TO3:PLAY"V31;O5;L220;B
GC;O3;BGC":NEXT
460 Q$=INKEY$
470 IFQ$="1"THEN500ELSEIFQ$="2"T
HEN510ELSEIFQ$="3"THEN520
480 GOTO430
490 X$=A$:C=RND(13):D=RND(4):A$=
STR$(A(C))+","+STR$(B(D))+";":RE
TURN
500 W=RND(4):LINE(55,97)-(A(W),B
(D)),PSET:LINE-(55,97),PRESET:GO
SUB530:GOTO430
510 W=RND(5)+4:LINE(126,97)-(A(W
),B(D)),PSET:LINE-(126,97),PRESE
T:GOSUB530:GOTO430
520 W=RND(4)+9:LINE(181,97)-(A(W
),B(D)),PSET:LINE-(181,97),PRESE
T:GOSUB530:GOTO430
530 FORI=1TO2:PLAY"V31;O1;L255;E
;O5;BCBC":NEXTI:IFA(W)=A(C) THEN
550
540 RETURN
550 DB=DB+1:DRAW"BM"+A$+SE$:PMOD
E3,1:SCREEN1,1:FORK=1TO3:PLAY"O5
;L255;GCGC;O1;DD":NEXTK:PMODE4,1
:SCREEN1,1:GOSUB580:RETURN
560 K=TIMER:PMODE3,1:SCREEN1,0:S
OUND10,26:CLS0:PRINT@130,"YOU TO
OK";:PRINT USING"#####.#";K/60;:
PRINT"  SECONDS. ";
570 DB=0:FORI=1TO4000:NEXT:RESTO
RE:FORI=1TO40:READA:NEXT:PMODE3,
1:PCLS:SCREEN0,1:GOTO160
580 BH$=STR$(5+(DB*22)):DRAW"BM"
+BH$+",180;"+SE$:RETURN
590 REM 'ALPINE ALIENS' BY FRED
B. SCERBO, IMB, COPYRIGHT (C)
1981, ILLUSTRATED MEMORY BANKS,
P.O.BOX 289, WILLIAMSTOWN, MA.,
01267-0289
```

Software Review...

This Lunar Lander Is O.K. For Small Systems

We've seen a bunch of lunar landers in our time, and, considering that this one is available for a 4K system, it isn't really bad.

It would be unfair to compare it to a 16K lander program written in Extended Basic. With that sort of option, you have high resolution graphics and many more options than are available with less memory and a less powerful ROM. But, taken for what it is, *LUNAR LANDER* is a good rendition of the much-done program and is certainly a cut above the "readout only" lander programs we have seen.

(Rainbow Connection Software, 3514 6th Place N.W., Rochester, MN 55901, $11.95 cassette with *Math Drill*; $26.95 on cassette with seven other programs; eight-program disk $31.95 plus $2 shipping)

Software Review...

MARS Adventure Is An Entertaining Program

The setting for *MARS ADVENTURE* is, as one might reasonably expect, on the planet Mars and this one is replete with enough good gadgets and other things to keep you wondering and working pretty hard at the story line.

You start out in the control room of a ship and have to move on from there. Will you venture outside (you can see things through the port)? Will you explore the ship. Just what to do?

In short, this is an entertaining program which handles the non-graphic Adventure well. Our only complaint is that sometimes words are split on lines. But that is a minor annoyance, at worst. The plot is interesting, the setting a little different from the usual castle-or-dungeon and the responses fast.

Is someone, or some*thing* watching you? You'll see!

(Aardvark-80, 2352 S. Commerce, Walled Lake, MI 48088, $14.95)

R.S. COLOR DISK SYSTEM SOFTWARE

DISK EDITOR/ASSEMBLER - This package includes a full featured disk based text editor program and a disk to disk/tape/memory assembler. The text editor is an easy to learn full featured editor which allows files larger than memory to be created and edited with ease. It is compatible with ASCII formatted tape & disk files to allow easy conversion of tape based programs. The assembler supports the full 6809 processor instruction set and will cross assemble 6800 code to 6809 object code. The output object file can be directed to either disk, tape or memory with overwrite protection. The object listing can be output to the screen or printer and versions for printers with or without line feeds are provided. DISK EDITOR & ASSEMBLER $79.95

DISK TERMINAL PACKAGE - A disk based Terminal program for your color computer features full text buffering, baud rates from 300 to 9600 baud, programable word length, parity bits odd/even/none, stop bits. The buffer size is automatically set to the maximum size of your memory. Full control codes can be sent, display word wrap is automatic. The text buffer can be saved or loaded from/to tape or disk. The contents of the buffer can be sent as a file with automatic re-entry to terminal mode, also a file can be sent directly from disk to another user. The contents of the buffer can be displayed on the screen or optionally be output to a printer plugged into the RS 232 port. All file formats are directly compatible with our text editor and word processor programs. DISK TERMINAL PACKAGE $49.95

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TEXTPRO II TEXT EDITOR/ WORD PROCESSOR - Includes all the features of TEXTPRO I plus: 10 programable tab stops, can be used with horizontal tab to next location, center over tab column, decimal allignment on tab column, right justify to tab column, tab to programed column. Also tab commands can use specific values for tab columns or programmed values. Other additions include: character fill, right justify line, programable footer can be centered/right justified/double width or almost any processor commands can be used with it, 3 programable header lines, expanded footnotes and processable keyboard input data during word processing. DISK TEXTPRO II $79.95

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Using this system to run FLEX and OS-9 has many advantages. First, it gives you 48K from zero right up to FLEX. This means that *ALL* FLEX compatible software will run with *NO MODIFICATIONS* and *NO PATCHES!* There are no memory conflicts because we moved the screen up above FLEX which leaves the lower 48K free for user programs.

What you end up with is 48K for user programs, 8K for FLEX and another 8K above FLEX for the screens and stuff. We have a multi screen format so you can page backward to see what scrolled by and a Hi-Res screen that will enable us to have 24 lines by 42 character display is on the way. That's better than an Apple!

We also implemented a full function keyboard, with a control key and escape key. All ASCII codes can now be generated from the Color Computer keyboard!

We also added some bells and whistles to Radio Shack's Disk system when you're running FLEX or OS-9. We are supporting single or double sided, single or double density, 35, 40 and 80 track drives. If you use double sided drives, the maximum is three drives because we use the drive 3 select for side select. When you are running the Radio Shack disk, it will work with the double sided drives but it will only use one side and only 35 tracks. Using 80 track drives is okay, but will not be compatible with standard Radio Shack software. You can also set each drive's stepping rate and drive type. (SS or DS - SD or DD)

In case you don't understand how this works, I'll give you a brief explanation. The Color Computer was designed so that the roms in the system could be turned off under software control. In a normal Color Computer this would only make it go away. However, if you put a program in memory to do something first (like boot in FLEX or OS-9), when you turn off the roms, you will have a full *64K RAM* System with which to run your program.

Now, we need the other half of the 64K ram chips to work, and this seems to be the case most of the time, as the article states. Of course, you could also put 64K chips in.

Some neat utilities are included.

MOVEROM moves Color Basic from ROM to RAM. Because it's moved to RAM you can not only access it from FLEX, you can run it and even change it!! You can load Color Computer cassette software and save it to FLEX disk. Single Drive Copy, Format and Setup commands plus an online help system are included.

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CODE X = XBASIC, 9 = 6809, 8 = 6800, P = PASCAL

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Followup. . .

Your Video Display Generator And The PMODE4 Colors

By Fred Aldrich

After working through Al Curtis' article on PMODE4 *(the RAINBOW, June, 1982)*, I was interested in what was actually going on in the hardware. I got out my circuit diagrams and my Video Display Generator (VDG) specs and did some PEEKing. The results were quite surprising. But, first, some hardware background is in order.

The graphic modes of the VDG are controlled by pins labeled CSS, GM0, GMI, GM2 and G/A, which are connected to bits three through seven of the U4 PIA 'B' Register respectively. These can be set or read by POKEing or PEEKing bits 3-7 of location &HFF22. In VDG mode 6C (PMODE 3), &HFF22 contains &HEx, where x can be any value. In VDG mode 6R (PMODE 4), &HFF22 contains &HFx. The VDG can be toggled from 6C to 6R (PMODE 3 to PMODE 4) by executing the following statement:

POKE &HFF22, PEEK (&HFF22) OR &H10

This turns Bit 4 (GM0) on.

Now, back to the results:

1. The PMODE statement does *not* change the state of the hardware. PMODE only sets up software parameters in low memory. The SCREEN statement sets up the VDG and SAM hardware for the desired graphics mode.

2. With the exception of Listing 4 with the Line 50 SCREEN 1,0 added and Listings 6, 7 and 8, Mr. Curtis' programs are running with the VDG set to the 128x192 pixel four-color (PMODE 3) mode, *not* the high-res 256x192 pixel two-color (PMODE 4) mode. This can be demonstrated by PEEKing or POKEing &HFF22 immediately after the PMODE 4 statements.

3. Listing 4 with the added SCREEN statement and Listings 6, 7 and 8 do provide what appears to be two different hi-res four-color (PMODE 4) modes.

The following listing should help explain how the additional colors are produced when the hardware actually supports only two sets of colors (green/black or buff/black).

```
10 PCLEAR 4:PMODE 4:SCREEN 1,S:PCLS
20 FOR Y=48 TO 95
30 FOR X=0 TO 255 STEP 2
40 PSET (X,Y)
50 PSET (X+1, Y+48)
60 PSET (X,Y+96):PSET (X+1, Y+96)
70 NEXT X, Y
80 S=1-S:SCREEN 1,S:FOR I=1 TO 500: NEXT:GOTO 80
```

This routine addresses each of the 256x192 pixels on the high-res screen individually in pairs. The screen is initially set set to black by the PCLS statement. Line 40 turns on the odd-numbered pixels on the second quarter of the screen while Line 50 turns on the even-numbered pixels on the third quarter. Line 60 turns on pixels on the bottom quarter of the screen while line 80 toggles the screen between color sets 0 and 1.

As noted by Mr. Curtis, turning alternate (odd or even) pixels on produces the undocumented gray/medium green or cyan/orange colors.

Perhaps the hardware types can provide a more complete explaination of this phenomenon, but it appears to me that the added colors are regulated to the band width of the RF modulator and TV set and their inability to accurately display pixels which are alternately on or off.

All the background for this information came from *The Facts* by Spectral Associates.

Book Review...

Color Graphics Book Is A Real Boon For 80C

For all of us who have been struggling with the deeper intricacies of Color Graphics, author Don Inman has written *TRS-80 Color Computer Graphics*, which explains things very well and will help unlock a lot of the secrets.

Inman starts from the beginning and works through all the details of color graphics on the 80C, even including some extra notes on the SOUND and PLAY commands. The style, as with other works Inman has done for other computers, is breezy, light and full of information. You almost don't even know you are learning—but you are. And a great deal, at that.

In addition, Inman gives you several different things to try with all of his examples. For some, he gives the answers. Others you have to either figure out or write him.

Since there is more than one way to do almost anything, this approach is an excellent one. You may even discover something that works better than does the author's suggested "correct" answer.

We are very high on *TRS-80 Color Computer Graphics* and believe it a worthwhile addition to your collection—whether you are interested in creating complicated graphics or just drawing happy faces. Inman's explainations are outstanding and his understanding of how things work (based on a number of earlier writings for the Model I/III) are quite good.

We think you will enjoy, read, re-read and learn a lot from this fine book.

(TRS-80 Color Computer Graphics by Don Inman, Reston Publishing Co., 11480 Sunset Hills Rd., Reston, VA 22090, $14.95)

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More Utilities coming - - Keep watching this space!

Software Review...

Even Halflings Will Like *Fantasy Gamer's Package*

There is obviously a great deal of interest in fantasy and role-playing games like Dungeons and Dragons™. That is one of the reasons we carry a regular column on the subject.

But, in a lot of ways, these games can be a bummer. They are difficult to get started (lots of characters and monsters to create), sometimes slow in the playing (it takes time to explain rooms and the like) and oodles of charts and so forth to either keep handy or memorize.

Sounds liker a job for a computer.

Not only is it a job for a computer, but, in the hands of an experienced dungeonmaster and programmer, fantasy and role-playing games can be a whole lot more fun. With *FANTASY GAMER'S PACKAGE,* much of the drudgery of setting up, playing and the like is eliminated.

This package comes in both 16K and 32K versions. The primary difference between them is that the 32K package combines all the parts into one program and adds an additional module called Dice Bag, which allows you to simulate the roll of poly-sided dice (very much like a program printed in *the RAINBOW*).

The first module will allow you to display 99 different rooms on the 80C's screen. The rooms are all to scale, and are complete with colors, doors, steps, pillars and the like. The way this works is that the game's referee simply uses a set of rooms drawn to scale in the documentation which accompanies the programs to create his own "universe." The rooms can then be filled with treasure, nasties, monsters or what-have-you. And, as the adventurers enter one of these rooms, the referee merely must type in the room's number and it appears on the screen. This can save a lot of description time. Besides, you remember what Mao said about a picture being worth a thousand words. Quicker, too.

A bonus! There is a completely mapped-out dungeon included, with the numbers of the rooms supplied.

Module Two allows for the creation of both player and non-player characters. This is done in fine detail, as you can imagine is required by the dungeonmaster/author of this program. In setting up a FRP game, this character creation process can be extremely time-consuming. The whole complicated mish-mash is done quickly with the 80C and this program.

Our one complaint with the program comes here. We believe there should be output to a printer built in. You could load a program to allow dual printing to both screen and printer, however.

We really cannot say too much, however, about the sophistication of the character-generator program. Those of you familiar with the D&D™ series have an idea of how many charts may need to be consulted. This handles them all quickly and without error.

No FRP game would be complete without monsters, and you can get a variety of them in all their detail with the third module. A couple of keys pressed and you have your monster, all ready to strike terror into the . . .

FANTASY GAMER'S PACKAGE is a user-friendly, well-conceived and finely executed series of programs. If you are "into" FRP games, it is a must which will increase your enjoyment of these activities many-fold.

(Prickly-Pear Software, 3518 S. Randi Place, Tucson, AZ 85730, $19.95 for 16K; $24.95 for 32K, plus $1.50 shipping)

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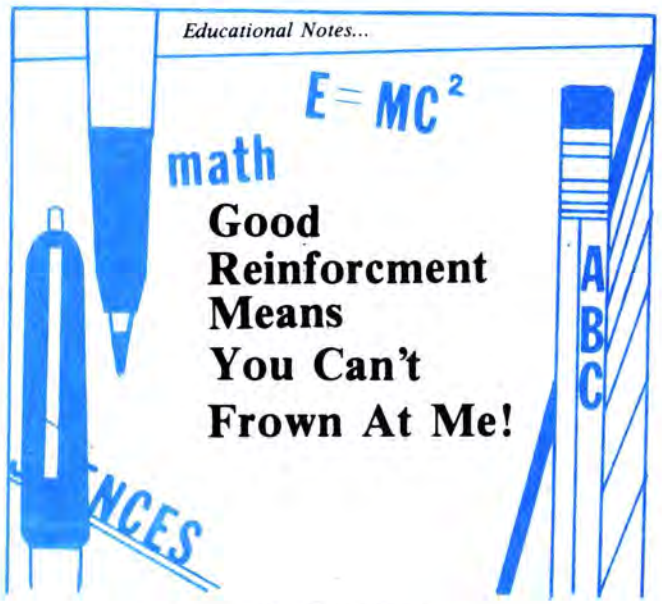

By Steve Blyn
***Rainbow* Education Columnist**

(Mr. Blyn, who teaches both exceptional and gifted children, holds two Master's degrees in the field of education and has won an award for the design of a computer program to aid handicapped children. He and his wife, Cheryl, own Computer Island.)

Reinforcement is a very important component of all teaching programs. It is a terrific feature of computers in that they can provide endless and immediate rewards for answers.

The computer never loses patience or tires of telling us whether we were right or wrong. The immediate reinforcement given by computers is much more effective than the long-awaited reinforcement that teachers can give by marking test papers. Often, by the time a test is graded, the student has already forgotten which answers he used.

Reinforcement can be either positive or negative. Positive reinforcers are pleasant events that follow a desired response. Happy faces and pleasant sounds are good examples of this. Their effect is to increase the chances that the person will make a similar response again to a similar question or situation.

Negative reinforcers are unpleasant events that follow an undesired response. Their effect, however, also increases the chance of the desired response. The person tries to escape the negative reinforcer and aims for the positive one.

Sad or unhappy faces are thought to be good examples of negative reinforcers. Herein lies the mistake often unwittingly put into educational programs!

When children begin to use new software, they are fascinated with the positive reinforcers used by the programmer. After a while, however, they sometimes get bored or adventuresome and begin to "check out" the negative ones.

It is the natural playfulness and curiosity of kids that leads them down this path. It has nothing to do with whether they know the right answers. Often, to everyone's surprise, the negative reinforcers are more attractive than the positive ones.

Sad, unhappy, frowning faces are often more amusing to see than the happy one. The bad sounds may have become more entertaining than the good sounds. When this situation occurs the reinforcers are counterproductive and learning ceases.

The important consideration when writing educational programs which will help children learn is to keep your rewards appropriate to their function. Make certain that your positive rewards are enjoyable to the player. Check to be sure that your negative reinforcers are not too entertaining. Inform the user that he has made a wrong response by using appropriate sounds to indicate an incorrect answer.

It is wise to further reinforce the response that you want by showing the correct answer to each wrong response. Therefore, immediately indicate the correct answer. Between the unpleasant noises and the correct answer appearing anyway, the user will not be anxious to purposely give wrong responses. Your program will then be used in the manner in which you intended.

The accompanying program, *OPPOSITES*, illustrates the use of happy sounds and a happy face for positive reinforcement. Incorrect responses receive several unpleasant sounds, no picure and the right answer.

Other positive reinforers might be a well-known song for each right answer, or a little game to play after a series of right answers. An example of the wrong thing to do would be to program the song *Taps* for an incorrect response. *Taps* is great for a game program, but has no place in a teaching program.

Although this program was designed for antonyms, it can just as easily be used for synonyms by changing half of the data and some of the program's wording. Other obvious uses would be for reading, social studies, science, spelling or math vocabulary words and their definitions.

Experiment with this program. You may convert or enlarge it, try various rewards, and make it suit your purposes.

The Listing:

```
10 REM'    OPPOSITES
20 REM'    BY STEVE BLYN
30 CLS
```

---Continued on Page 46

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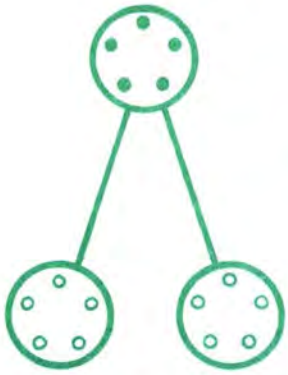

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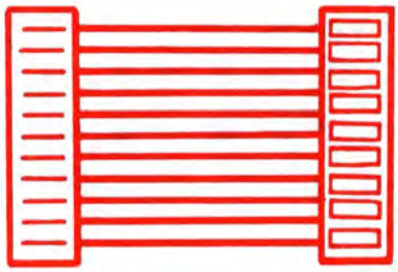

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PIPELINE

NOW THERE ARE TWO. Bob Rosen and Spectrum Projects, which have been running the nation's most popular BBS for Color Computer users for more than a year now, introduce a second BBS to accomodate all those people who want to hook up.

As always, Color BBS 1 is available at (212) 441-3755. But now, you can also call (212) 441-3766 for Color BBS 2.

The new BBS is operating on a 32K Color Computer with three drives. The software was written by Lee Blitch of Atlanta. One unique feature of the second BBS is the ability to transfer color graphics over the telephone lines. And, while users must have the Colorcom/E terminal program to access the graphics, a downloading section is planned for the future.

* * * * * *

JUST ABOUT READY TO GO is a new book on using Color Basic by Steve Blyn of Computer Island. We are told this offering will be a "disposable," so that you can write your answers to questions in it.

The title is *A Byte Of Color Basic* and it should be ready for sale in a week or two.

* * * * * *

SPEAKING OF BOOKS, there are a couple of new ones from Radio Shack by the very popular authors Bob Albrecht and George Firedrake. One of them is *My TRS-80 Likes Me* and the other is *Number Patterns*.

My TRS-80 Likes Me is a series of programming excercises that will introduce students to Basic statements and commands. This is accomplished through subroutines demonstrated in game programs.

* * * * * *

A "ROMPACK ELIMINATOR" is expected to be offered soon through Computer Mate (3300 Don Mills Rd., Willowdale, Ont. M2J 4X7) for $21.95. It is in the form of a machine language program which will convert a ROM Pack to run on disk. As usual, the program is marketed only as a backup or an alternate running source for your own ROM Packs.

* * * * * *

FROM AUSTRALIA comes the first Color Computer program to be marketed in the northern hemisphere. DSL Computer Products will soon have *COPY CAT* available — a method of making backups of machine language programs. This one was written by Ron Wright of Melbourne.

As a matter of fact, the Color Computer is gaining a great deal of acceptance in a number of countries. We see that through inquiries we get about subscriptions and advertising and we are pleased to see the 80C building up as an "international computer." Of course, there are thousands of 80C's in Canada, but we note an influx of interest from Mexico, Great Britain and a number of other places, particularly Saudi Arabia.

Too, in the next month or so, we plan to publish the first non-North American program for the 80C. One of our newest contributors is from Austria. You'll be seeing that evidence of the growing world popularity of the 80C soon.

* * * * * *

A CORRECTION is in order for the Universal Data File program which appeared recently in *the RAINBOW*. Line 1100 has one of those "!" that should have been a Basic keyword. In this case, substitute the "!" with a WRITE. If you use this program as a calendar, you will probably wish to change the date in Line 1720 to "1982."

* * * * * *

A NEW MODEM is available from Hayes Microcomputer Products (5835 Peachtree Corners East, Norcross, GA 30092). It is called the Hayes Stack™ Smartmodem 1200 and is said to be able to allow RS-232 computers or terminals communicate over telephone lines at 1200 bits per second.

This new modem connects directly with the telephone line and the RS-232C port, is approved by the FCC and can be used with either Touch-Tone or pulse dialing. It can operate at 0-300 bits per second as well as 1200. Cost is $699 with power pack, cables and so on.

* * * * * *

A FOUR-COLOR PLOTTER will soon be available from Radio Shack. The cost is pretty low for this sort of hardware, $249.95. We have its smaller brother in-house with our PC-2 computer, and the printer is a lot of fun to watch and extremely versatile. This product should be a nice feature to think about, as it will print in four colors on 4½-inch paper and do all sorts of fancy things. It should be available about September.

* * * * * *

POOR TOM MIX OF Tom Mix Software called the other day to tell us about a real problem he has. It seems he gets a number of calls wondering if he is for real. Or, as Tom puts it, "there just aren't a lot of people named Tom Mix around and people think its a put-on." As far as we can tell, and we've known Tom for some time now, that's a real name. Tom's a little put out at his mother for causing him some trouble—but there isn't much he can do about it.

By the way, I know few of you will believe this, but the first time Tom called us the next person to leave a message was a gentleman named Jesse James. He wanted a subscription. Both Mr. Mix and Mr. James are "for real."

You just never know. . .

* * * * * *

IN THE AREA OF LANGUAGES, Radio Shack is now announcing both LOGO and PILOT for the 80C. And, you know there are a number of FORTH programs available as well from independent software houses.

The LOGO program will use the popular "Turtle Graphics" and be available on a disk for $99.

The PILOT program will be available on either disk or tape and is a powerful programming language which is very useful for educators and teachers. The package will sell for $59.95 on tape and $79.95 on disk.

* * * * * *

A NEW DRAWER program to be used with joysticks is available from Greathouse and Company (P.O. Box 27051, Rancho Bernardo, CA 92127). It is said to allow quick and easy drawing on the graphics screens with more than 40 different commands on two menus which will allow the construction of lines, rectangles, dots, circles and PAINTing. It also comes with two complete character sets for writing messages on the screen. Price is $19.95.

* * * * * *

A NEW DESKTOP Printer/Video stand is now being marketed by Effort-Saver Products (P.O. Box 5001, Hialeah, FL 33014) for $39.95. The stand will allow you to "elevate" your printer and store the paper beneath it. Or, as an alternative, you could use it to elevate your monitor.

* * * * * *

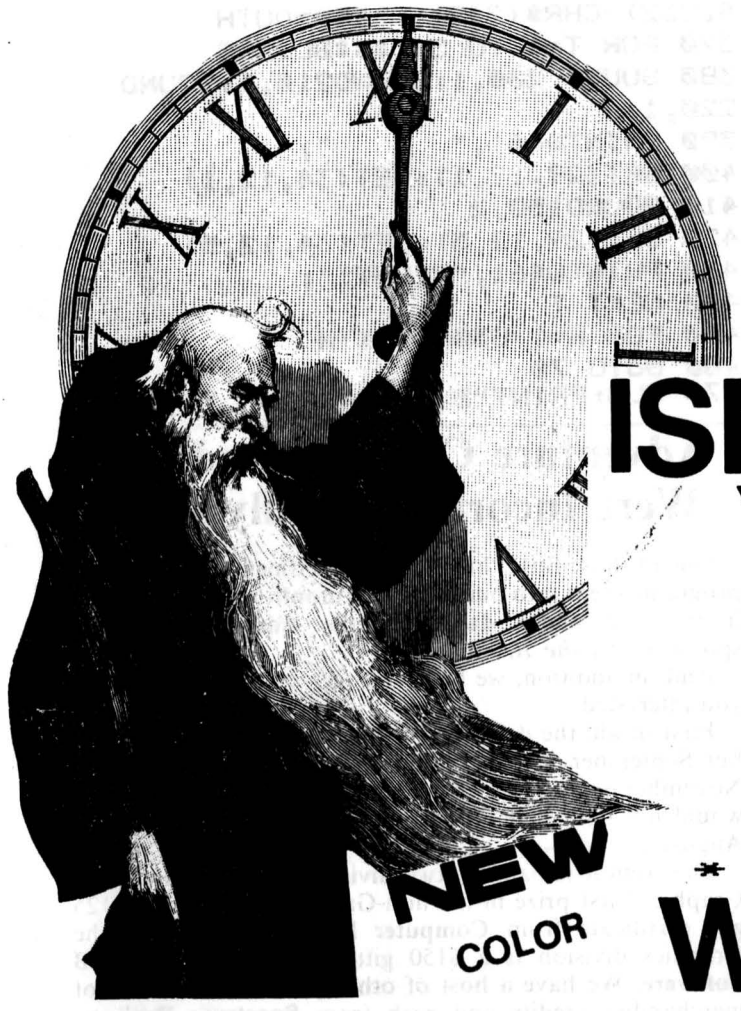
BRITT MONK, OF *GAUNTLET* and ***BREAKAWAY*** fame, has been tapped by Avalon Hill Game Co. to convert their *SHOOTOUT AT THE OK GALAXY* game from Apple/Atari to the 80C. Under his agreement with Avalon Hill, Britt is allowed to sell a small number of "signature" editions for $22 from his own offices at P.O. Box 802, Elyria, OH 44036.

* * * * * *

ELECTRONIC SPECIALISTS, INC. HAS SET up a toll-free hotline to provide assistance for those who have microcomputer interference problems. The number is 1-800-225-4876, between 9 a.m. amd 4 p.m. EST weekdays.

* * * * * *

WE HEAR MAPLE LEAF SYSTEMS (P.O. Box 2190, Station "C", Downsview, Ont. M2N 2S9) is working on a multiple-slot expansion board for the 80C. No details yet other than it is hoped the board will allow four cartridges to be connected to the 80C at the same time. A similar product, we also hear, is under development in the United States. No hard and fast information on it yet, though.



Every day more people learn the name of the one software company that more Color Computer owners have gotten software from than all the other software companies combined; the one company that has given away thousands of free programs that are superior to some you might pay for!

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EDUCATION — from Page 41

```
40 PRINT@64,"directions:TYPE IN
THE WORD THATYOU THINK IS THE OP
POSITE OF THEWORD YOU SEE ON THE
 SCREEN."
50 PRINT @192,"PRESS ENTER TO BE
GIN";:INPUT Y$
60 DIMA$(10),B$(10)
70 F=F+1
80 IF F>20 THEN 470
90 X= RND(10)
100 RESTORE
110 FOR J=1 TO X
120 READ A$(J),B$(J)
130 NEXTJ
140 CLS
150 PRINT:PRINT"#";F;". WHAT WOR
D IS THE OPPOSITE OF ";A$(X),:IN
PUTC$
160 IF C$=B$(X) THEN 320
170 IF C$<>B$(X) THENPRINT:PRINT
: PRINT" SORRY, ";C$" IS NOT":PR
INT" THE OPPOSITE OF ";A$(X)
180 PRINT:PRINT:PRINTB$(X);" IS
THE OPPOSITE OF ";A$(X);"."
190 FOR T= 1 TO 5:SOUND 50,5:NEX
T
200 PRINT@388,"PRESS ENTER TO GO
 ON";:INPUT R$:GOTO70
210 DATA BOY,GIRL
220 DATA UNCLE,AUNT
230 DATA IN,OUT
240 DATA HOT,COLD
250 DATA ON,OFF
260 DATA OPEN,CLOSE
270 DATA MORE,LESS
280 DATA WIN,LOSE
290 DATA UP,DOWN
300 '***FACE
310 DATA STOP,GO
320 K=0:CLS7:FORG=1TO6:FOR Y=(11
96+K)TO(1203+K):POKEY,255:NEXTY
330 K=K+32
340 NEXTG
350 SET(29,12,5):SET(34,12,5):'*
**EYES
360 PRINT@301,CHR$(246)+STRING$(
4,252)+CHR$(249);:'***MOUTH
370 FOR T=1 TO 5:'***BLINKS
380 SOUND 200,1:SOUND210,1:SOUND
220,1
390 PRINT@461,"      ";
400 SET(29,12,1):SET(34,12,1)
410 SOUND150,2
420 SET(29,12,5):SET(34,12,5)
430 PRINT@461,"RIGHT!";
440 NEXT T
450 FOR H=1TO300:NEXTH
460 GOTO 70
470 CLS:PRINT"BYE FOR NOW"
```

Adventure Contest Deadlines Were Incorrect In July Issue

One of those little "bugs" that sometimes creeps into our programs crept into our brain last month when we printed information about dates for the Adventure Contest sponsored by *the RAINBOW*.

And, in addition, we have a longer list of prizes to keep you interested.

First of all, the deadline for the contest is not August 1, but September 30. The winner will be announced in the November issue. Sorry about the confusion. Obviously, you would not have had time to write a decent Adventure by August 1.

The contest remains in two divisions, Graphic and non-Graphic. First prize in the non-Graphic division is a $125 gift certificate from **Computer Plus**. First prize in the Graphics division is a $150 gift certificate from **JARB Software**. We have a host of other prizes, in the form of merchandise credits and cash from **Spectrum Projects, Prickly-Pear Software, Superior Graphic Software, Custom Software Engineering, Nanos Systems Corp., Spectral Associates, Illustrated Memory Banks, Computer Island and Transformation Technologies.**

To win, all you have to do is write an Adventure program and submit it to *the RAINBOW*. A complete list of winners will be published in the November Adventure Issue.

Non-graphics Adventures must not use more than a title card and an end-of-game graphic. All entries become the property of *the RAINBOW* and none can be returned.

By submitting an entry, the author gives Falsoft, Inc. the exclusive right to print, publish or otherwise use both program and the author's name. The decision of the judges is final.

We encourage you to enter this contest.

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Adventure—Part II...

Now, Make Your Own Adventure With *ADVMAKER*

By Jorge Mir
***Rainbow* Utilityman**

We hope you enjoyed playing *RAINBOW ADVENTURE* last month. We know the listing was pretty long, but it does take some amount of code to be able to create an Adventure game.

As we said last month, we are now going to dissect the *RAINBOW Adventure* and show you how to create one of your own.

For one thing, you'll notice that we had a great number of REMark statements in last month's program. That was to guide you in making your own Adventure.

This month's program, *ADVMAKER* is a "canned" type of program designed to simplify the programming of Adventures written in BASIC.

It is simple, straightforward and very easy to follow. Also, even though it is written in BASIC, it does not suffer from the common "slowness" problem. Indeed, it is rather "fast."

Following is a brief explaination of the various sections of the program:

Lines 10-110: These are the DIMension statements and the loops to read the directions, rooms, objects and verbs which are entered as DATA statements.

Lines 120-270: This section indicates where you are, what you can see and the directions available.

Lines 270-999: Here is where the Adventurer's commands are analyzed to determine the programmed course of action. The various subsections are one word commands (280-300); items carried in inventory (310-350); scoring (360-420); vocabulary expansion (500-599); moving in various directions (710-760); and the "help" section (800-999).

Lines 1000-2999: Here the program is directed to the various verb areas (see Line 600 to find out how verbs are identified). REM statements have already been included in the various subsections for some of the basic verbs normally used in Adventures.

Lines 3000-6999: DATA statements for directions (3000), rooms (4000), objects (5000), and verbs (6000) are included here.

Lines 7000-7180: Save and load routines.

Lines 8000-8030: Section to eliminate objects from the Adventure.

There is no limit to the type of conditions, or scenarios, which could be dreamed up for an Adventure, so I will not attempt to cover them all in detail. Instead, I developed a short, simple Adventure so you can become familiar with the various statement examples. I called this Adventure *Rainbow* for obvious reasons.

Please note that with *ADVMAKER* there are added steps which must be typed in exactly as shown. Do not renumnber any of the steps or it will not work at all.

The following definitions will make it easier for you to follow each of the steps:

—RM$(#) is the Room description
—OB$(#) is the Object description
—OB(#) is the Object number
—D$(#, 1-6) is the directions of each room
—D$(1-6) is the various directions available
—F(#) are flags to indicate various conditions
—F is the flag used in subroutines
—MX is the maximum number of objects in inventory

—Continued on Page 49

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ADVMAKER — from Page 47

—CA is the number currently in inventory
—O is the object number
—V is the verb number
—YOU is the current room number

It is important that you excercise care in selecting words to describe rooms and make sure you you do not have more than one object with the same definition. Remember that the statement "I AM" will precede the room definition, so define your rooms as "inside a building", "on a boat", "in a closet" and so on. How objects are defined is not as important, but the related abbreviation is, so you have to make sure the abbreviation for an object is not repeated.

The same goes for verbs, so you should avoid similar verbs with different meanings. Note that only the first three letters of the verbs are used. So, "break" and "breathe" will present some problems.

An example of a DATA statement for rooms would look like this: DATA ON MAIN STREET, 4, 6, 0, 0, 0, 0. The numbers indicate the directions available (order is N, S, E, W, U, D). So, in the above example, the room is "On Main Street" and has an exit to room 4 on the north and room 6 on the south. No other exits are available because a zero indicates the direction is not used.

The format for objects is "Object Description, Abbreviation, Room Location." For example," DATA A SMALL HAMMER, HAM, 5" would indicate the object to be a small hammer, identifiable by the three letters "ham" and to be located in room 5.

Now that you know a little about the various functions of the *ADVMAKER* program and DATA statement format, take a look at the *RAINBOW ADVENTURE* and you will see how simple the whole thing is. Just because it is rather simple, don't kid yourself. You will always want to tinker with it a bit to add some more goodies here and there.

The REM statements have been added to help you determine what each program line is to accomplish. These REM statements do not need to be typed in.

So, now is the time to get going. Use *ADVMAKER* listed below and use *RAINBOW ADVENTURE* from last month's issue as a guide. And, create your own Adventure.

I hope the *ADVMAKER* will get you involved in the fascinating Adventure area. It is a lot of fun. Whenever we are planning to have some company over, it only takes me about an hour to dream up a quick, short Adventure suitable for the occasion and, believe me, it always turns out to be a big hit.

The Listing:

```
1 '   **** ADVENTURE MAKER ****
2 '
3 '          BY: JORGE MIR
4 '
5 '             (C) 1982
6 '
7 '   ****************************
10 CLEAR 1000
20 CLS
30 DIM RM$(85),OB$(85),OB(85),D(
85,6),D$(6),F(10):MX=5:CA=0
40 FOR X=1TO6:READ D$(X):NEXTX
50 X=0
60 X=X+1:READ RM$(X):IF RM$(X)="
END" THEN 80
70 FOR Y=1TO6:READ D(X,Y):NEXTY:
GOTO60
80 X=0
90 X=X+1:READ OB$(X):IF OB$(X)="
END"THEN NO=X-1:GOTO100:ELSE REA
D I$,OB(X):OB$=OB$+I$:GOTO90
100 X=0
110 X=X+1:READ I$:IF I$="END" TH
EN 120 ELSE VB$=VB$+LEFT$(I$,3):
GOTO110
120 CLS
130 YOU=1
140 PRINT"I AM ";
150 PRINT RM$(YOU)
160 PRINT"I CAN SEE: ":F=0
170 FOR I=1 TO NO
180 IF INT(OB(I))<>INT(YOU) THEN
 200
190 PRINT "   "OB$(I):F=1
200 NEXT:IF F=0 THEN PRINT"  NOT
HING INTERESTING"
210 PRINT"YOU CAN GO: "
220 FOR I=1TO6
230 IF D(YOU,I)<>0 THEN PRINT" *
" D$(I);
240 NEXT
250 PRINT
260 PRINT STRING$(32,61);
270 INPUT"WHAT SHOULD I DO";I$
280 IF I$=""THEN270 ELSE IF I$="
LOOK" THEN CLS:GOTO140
282 IF I$="QUIT" OR I$="END" THE
N END
```

—Continued on Next Page

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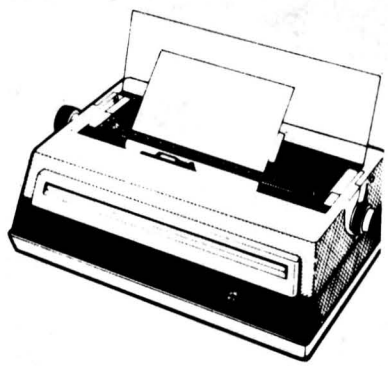
ADVMAKER — from Page 49

```
284 IF I$="SAVE" THEN 7010
286 IF I$="LOAD" THEN 7070
287 IF I$="OBJECT" THEN 9000
288 IF I$="ROOM" THEN 9100
290 IF LEFT$(I$,2)="GO" THEN PRI
NT"USE SINGLE LETTERS TO INDICAT
E  DIRECTION (EXAMPLE, N=NORTH)"
:GOTO260
300 IF LEFT$(I$,3)<>"INV"THEN 36
0
310 PRINT"I AM CARRYING:":F=0
320 FOR I=1TO NO
330 IF OB(I)=-1THEN PRINT OB$(I)
:F=1
340 NEXT:IF F=0 THEN PRINT"NOTHI
NG"
350 GOTO 260
360 IF LEFT$(I$,5)<>"SCORE"THEN
430
370 T=0:Y=0
380 FOR I=1 TO NO
390 FOR L=1TO LEN(OB$(I))
400 IF MID$(OB$(I),L,1)="*"THEN
T=T+1:IF OB(I)=YOU OR OB(I)=-1TH
EN Y=Y+1
410 NEXT:NEXT
420 PRINT"OUT OF";T;"POINTS YOU
HAVE";Y:GOTO 260
```

PRICKLY-PEAR SOFTWARE



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```
430 IF LEN(I$)=1 THEN 710
440 IF I$="HELP" THEN 800
450 SP=INSTR(I$,CHR$(32)):IF SP=
0 THEN PRINT"TRY USING TWO WORD
COMMANDS.":GOTO260
460 V$=LEFT$(I$,SP-1):O$=MID$(I$
,SP+1)
470 A$=LEFT$(V$,3):B$=LEFT$(O$,3
)
500 IF A$="TAK" THEN A$="GET"
501 IF A$="LEA" THEN A$="DRO"
502 IF A$="LOO" THEN A$="EXA"
503 IF A$="MOV" THEN A$="PUS"
504 IF A$="TEA" THEN A$="BRE"
600 V=(INSTR(VB$,A$)+2)/3:IF V<1
 THEN CLS:PRINT"SORRY, I JUST DO
N'T KNOW HOW TO":PRINT V$" ANYTH
ING.":GOTO 140
610 O=(INSTR(OB$,B$)+2)/3:IF O<1
 THEN CLS:PRINT"SORRY, I JUST DO
N'T SEE ANY ":PRINT O$" HERE.":G
OTO140
700 IF LEN(I$)>1 THEN 1000
710 V=0:CLS:IF I$="N"AND D(YOU,1
)<>0 THEN YOU=D(YOU,1):GOTO 140
720 IF I$="S"AND D(YOU,2)<>0 THE
N YOU=D(YOU,2):GOTO 140
730 IF I$="E"AND D(YOU,3)<>0 THE
N YOU=D(YOU,3):GOTO 140
740 IF I$="W"AND D(YOU,4)<>0 THE
N YOU=D(YOU,4):GOTO 140
750 IF I$="U"AND D(YOU,5)<>0 THE
N YOU=D(YOU,5):GOTO 140
760 IF I$="D"AND D(YOU,6)<>0 THE
N YOU=D(YOU,6):GOTO 140
770 GOTO 1000
800 '*****************************
810 '****** HELP SECTION ******
820 '*****************************
880 PRINT"TOUGH LUCK!  JUST KEEP
 TRYING!":GOTO260
1000 F=0:IF OB(0)=YOU THEN F=1 E
LSE IF OB(0)=-1 THEN F=2
1002 ON V GOTO 1100,1200,1300,14
00,1500,1600,1700,1800,1900,2000
,2100,2200
1010 IF LEN(I$)=1 THENPRINT"I CA
N'T GO THAT WAY!":GOTO 140
1020 PRINT"I DON'T UNDERSTAND WH
AT YOU ARE TELLING ME.":GOTO260
1100 '*** GET ***
1102 IF F=2 THEN PRINT"I ALREADY
 HAVE IT!":GOTO260
1104 IF F=0 THEN PRINT"I DON'T S
EE THAT HERE.":GOTO260
1106 IF CA=>MX THEN PRINT"I CAN'
T CARRY ANYTHING ELSE!":GOTO260
1199 OB(0)=-1:PRINT"OK, I GOT IT
.":CA=CA+1:GOTO260
```

—Continued on Page 52

Spectral Associates

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Second Prize	$500
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The submission deadline is November 15, 1982. Winners will be notified by December 1, 1982. Formal announcement of the winners will be made in the January, 1983, issue of **the RAINBOW.**

To enter, mail entries to **Spectral Associates**, P. O. Box 99715, Tacoma, Wa 98499. Further information available by writing or calling **Spectral** at (206) 565-8483.

*****Winner to be selected by a panel of respected judges*****

*Employees of **SPECTRAL ASSOCIATES** and their families are prohibited from entering the contest!*

Games which are submitted, win prizes and are subsequently published by *SPECTRAL ASSOCIATES* will receive full royalties and full author recognition will be given. Royalties will be paid *in addition* to the prize money.

ADVMAKER — from Page 50

```
1200 '*** DROP ***
1201 IF F=2 THEN PRINT"OK, I DRO
PPED IT.":CA=CA-1:OB(O)=YOU: ELS
E PRINT"I DON'T HAVE IT."
1299 GOTO 260
1300 '*** OPEN ***
1301 IF F=0 THEN PRINT"I DON'T S
EE IT HERE.":GOTO260
1399 PRINT"SORRY, IT DOES NOT OP
EN.":GOTO260
1400 '*** CLOSE ***
1401 IF F=0 THEN PRINT"I CAN'T C
LOSE ANYTHING THAT I  CAN'T SEE
 OR DON'T HAVE.":GOTO260
1499 PRINT"I TRIED, BUT IT DOESN
'T CLOSE.":GOTO260
1500 '*** EXAMINE ***
1501 IF F=0 THEN PRINT"I DON'T S
EE ANYTHING LIKE THAT  AROUND HE
RE.":GOTO260
1599 PRINT"NOTHING SPECIAL ABOUT
 IT.":GOTO260
1600 '*** PUSH ***
1699 PRINT"NOTHING HAPPENED.":GO
TO260
1700 '*** BREAK ***
1701 IF F=0 THEN PRINT"NOTHING L
IKE THAT AROUND HERE  THAT I CA
N BREAK.":GOTO260
1799 PRINT"I TRIED, BUT I COULDN
'T BREAK IT":GOTO260
1800 '*** ENTER ***
1801 IF F=0 THEN PRINT"I DON'T S
EE ANYTHING LIKE THAT  AROUND HE
RE.":GOTO260
1899 PRINT"I TRIED TO ENTER BUT
COULDN'T.":GOTO260
1900 '*** READ ***
1901 IF F=0 THEN PRINT"I DON'T S
EE IT HERE.":GOTO260
1999 PRINT "NOTHING SPECIAL":GOT
O260
2000 '*** LOAD ***
2001 IF F<>2 THEN PRINT"I DON'T
HAVE IT.":GOTO260
2099 PRINT"I TRIED, BUT NOTHING
HAPPENED.":GOTO260
2100 '*** RUN ***
2199 PRINT"DON'T BE RIDICULOUS!"
:GOTO260
2200 '*** SELL ***
2299 IF F<>2 THEN PRINT"I DON'T
HAVE IT TO SELL.":GOTO260
3000 '*******DIRECTIONS******
3010 DATA NORTH,SOUTH,EAST,WEST,
UP,DOWN
4000 '*******  ROOMS  *******
4999 DATA END
5000 '****** OBJECTS *****
```


Own a TRS-80 Color Computer? Wish you had Lower Case?

For $75.00 and five minutes of your time you can have full upper and true lowercase (not just reverse video) with the LCA-47 lowercase adapter from Micro Technical Products.

What is it? The LCA-47 is a small PC board (1.9 × 3.6 in.) that plugs into your computer's main PC board: leaves the expansion connector free. It doesn't take up any system memory: uses a fast Bipolar Character Generator for guaranteed operation.

Installation is quick and simple: no cutting or soldering required.

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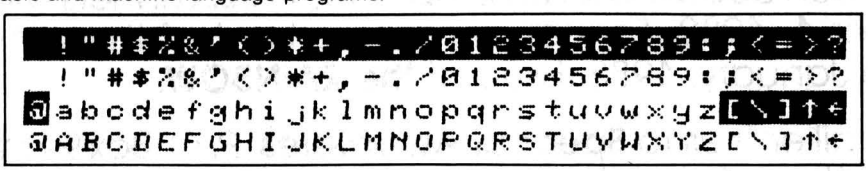
Two switches provided on board: one to enable or disable the lowercase. The other to invert the entire screen (light characters on a dark background).

What does it provide? The 128 characters below: improved upper case and very readable lowercase with descending tails, all available to both Basic and machine language programs.



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Custom character sets are available as an option, call for a quote.

Compatibility: The LCA-47 is fully compatible with all TRS-80C software that we know of, including Color Scripsit. It has no effect on any semi-graphics or full-graphics modes. Also works great with Micro-Chroma-68 Kits and others using the 6847 VDG chip! The LCA-47 will not fit under the RF shield if Computerware's "16-plus" memory board is installed.

How to order: Send $75.00 plus $5.00 shipping in the U.S., $10.00 elsewhere, to:

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814 W. Keating Ave., Dept. A
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Arizona residents add $3.75 sales tax.

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MC and VISA welcome.

```
5999 DATA END
6000 '****** VERBS ******
6010 DATA GET,DROP,OPEN,CLOSE,EX
AMINE,PUSH,BREAK,ENTER,READ,LOAD
,RUN,SELL
6999 DATA END
7000 '***** SAVE/LOAD ********
7010 GOSUB7130:OPEN"O",DV,"DATA"
7020 PRINT#DV,YOU
7030 FOR X=1 TO NO
7040 PRINT#DV,OB(X)
7050 NEXT X
7060 CLOSE:CLS:GOTO140
7070 GOSUB7130:OPEN"I",DV,"DATA"
7080 INPUT#DV,YOU
7090 FOR X=1 TO NO
7100 INPUT#DV,OB(X):NEXT X
7110 IF EOF(DV) THEN CLOSE
7120 CLS:GOTO140
7130 CLS:PRINT"INDICATE DEVICE T
O BE USED:"
7140 PRINT:PRINT"  C - CASSETTE
    D - DISK"
7150 PRINT:INPUT"YOUR CHOICE";DV
$
7160 IF DV$="D" THEN DV=1 ELSE I
F DV$="C" THEN DV=-1 ELSE 7150
7170 PRINT:PRINT"PRESS ANY KEY W
HEN THE DEVICE   IS READY."
7180 IF INKEY$=""THEN7180 ELSE R
ETURN
8000 '***ELIMINATE OBJECT FROM
8010 '   OBJECT LIST
8020 MID$(OB$,O*3-2,3)="   "
8030 RETURN
9000 INPUT"KEYWORD(S)";X$
9010 FOR X=1 TO NO
9020 IF INSTR(OB$(X),X$)=0 THEN
9050
9025 IF OB$(X)="END" THEN PRINT"
NO SUCH OBJECT":GOTO260
9030 CLS:PRINT"OBJECT NO."X
9032 PRINT OB$(X)
9034 PRINT "IN ROOM NO."OB(X)
9036 IF OB(X)=-1THEN PRINT"   IN
 INVENTORY" ELSEPRINT "   ";RM$(
OB(X))
9040 IF INKEY$=""THEN9040
9050 NEXT X:GOTO260
9100 CLS:INPUT"KEYWORD(S)";I$
9110 FOR X=1TONR
9115 IF INSTR(RM$(X),I$)=0THEN92
00
9120 PRINT"ROOM NO."X":"
9121 PRINT RM$(X):PRINT STRING$(
31,"=")
9122 FOR D=1TO6:IF D(X,D)<>0THEN
 PRINT D$(D)":":PRINT"   "RM$(D(
X,D))" -"D(X,D)
9123 NEXT D
9125 IF RM$(X)="END" THEN PRINT"
NO SUCH ROOM":GOTO260
9128 PRINT:PRINT"OBJECTS:"
9130 FOR D=1TO NO
9132 IF OB(D)=X THEN PRINT "   "
OB$(D);:PRINT" -"D
9134 NEXT D
9140 IF INKEY$=""THEN9140
9200 CLS:NEXTX
9210 GOTO 260
```

Software Review...

Your Children Will Enjoy *School Maze*

Has there ever been a child who didn't wish he or she could go wandering about his school at will, looking into things and just, generally, investigating?

SCHOOL MAZE is for all of those children. It is a graphic-oriented Adventure game that not only lets the youngsters have fun looking for a computer tape, but it also gives them some interesting things to do along the way.

For instance, they can visit the art room and do a little drawing, play music in the music room and shoot a basket in the gym. The whole Adventure is done with happy sounds, bright colors in low-res graphics and, generally, captivated the two youngsters we asked to play the game here. We even enjoyed our walk around the school.

SCHOOL MAZE is extremely well done and will provide a great deal of non-frustrating fun for the younger members of your family.

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Last of A Series...

Here Is How To Pick The NFL Winners This Season

By John Waclo

This is it! NFL football has arrived! Pre-Season action starts this month and the NFL regular season begins September 12.

Even if you haven't been following our series, this concluding part offers some real important information for football fans. Maybe we've saved te best for last?

Anyway, we intend to discuss different prediction strategies, and our game picks for the first few weeks of the 1982 season. Of course, we are using our 80C to make these predictions and we will tell you how as we go along.

For those who have been following the series, we conclude our final part with all the information you will need to collect and enter data for the programs we presened in Parts I and II (*the RAINBOW,* June and July, 1982). I hope you have them running by now, because you can practice your data collection with the NFL pre-season games.

From last year, we made the observaton that the NFL season seems to play very similar to a chess game. It appears to have deinite Opening, Mid-Season, and End-Season characteristics. Each has to be treated differently, so we will take them one at a time.

Opening Season Strategy
(Weeks 1-4)

Here's what we learned from last season:

The big power teams from the previous year tend to continue their winning during the opening weeks of the following season.

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For example, the most powerful teams after the 1980 NFL season were Philadelphia, Dallas, Atlanta, and Los Angeles, in that order. If you watched the performance of these teams for the first four weeks of the 1981 season, this is what you would have seen: Philadelphia 4-0, Dallas 3-1, Atlanta 3-1, and Los Angeles 2-2. As a group, they won 12 out of 16 or 75 percent for all games selected for the first month of the season. That's not too bad! By the way, these figures also include the spread. Will this repeat in the 1982 season? My 80C wil be watching.

Favorites also seem to have an advantage during the early weeks of the season. At least that's the way it was last year. Through the first four weeks of the '81 campaign, the underdog only won 38 percent of all games played. Favorites won 54 percent and the rest were "even" games. Since home teams tend to be favored in the early season, that could account for this statistic.

Home teams also tend to win with a higher percentage during the early weeks of the season. When you think about it, it is logical. Everybody is psyched up! The home team is ready to go. It's the first few weeks of the season. The home town crowd is going nuts! It's got to be hard for the visiting team in this situation. In the '81 NFL season, the home team won 59 percent of all games through week Four.

Mid-Season Strategy
(Weeks 5-13)

By the fifth week of the season, it's time to start using the data you have collected with your 80C from the four previous weeks. Opening season strategy can't be used anymore because the regular season is well underway by Week 5.

Starting with the *NFL REPORT* for Week 4, we take each Team Summary sheet and pair it with that particular team's opponent next Sunday. By Tuesday you can look at the sports page of your morning paper and get the "line" for every game to be played next weekend.

The first thing we do with the "line" is record it by the team name on their summary sheet. For example, if Pittsburgh was playing Dallas, and the line was Pittsburgh +5, we would mark a +5 by Pittsburgh Steelers on their team summary sheet. Next, we would add the "line" to the Power Factor shown on the sheet. That will give you Pittsburgh's Power Factor for *that* game. Subtract the Power Factor for Pittsburgh from the Dallas Power Factor and you will have the Power Factor *Difference* for that game. Do this for each of the 14 games to be played.

When you have calculated the Power Factor Difference for each game, identify the four games with the largest number. These are your best games to predict winners.

In following the above procedure, you have selected four games with the largest team mismatch. The process you have used took into account the line for that game, the number of wins for each team, the total offensive points scored by each team , and the total point allowed by each team. It's a powerful selection process.

Does this selection process work? Yes it does. A and you can check it. If you have the *NFL REPORT* program from Part II of this series, including the '81 season data, you could sit down and perform this procedure yourself for Week 5 through 13. If you did, here is what you would find:

You would have picked 24 winners correctly, 11 incorrectly, and tied 1. That's being right two out of every three times for nine consecutive weeks!

—Continued on Page 56

COLOR COMPUTER NEW!

MACRO-80C

The Micro Works is pleased to announce the release of its **disk-based editor, macro assembler and monitor**, written for Color Computer by Andy Phelps. THIS IS IT — The ultimate programming tool!

The powerful 2-pass macro assembler features conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. There are no changes, constraints or shortcuts in the source language definition. Incorporating all of the features of our Rompack-based assembler (SDS80C), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility.

The screen-oriented text editor is designed for efficient and easy editing of assembly language programs. The "Help Key" feature makes it simple and fun to learn to use the editor. As the editor requires no line numbers, you can use the arrow keys to position the cursor anywhere in the file. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which are longer than 32 characters.

DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

The editor, assembler and monitor — as well as sample programs — come on one Radio Shack compatible disk. Extensive documentation included. MACRO-80C **Price: $99.95**

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The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for **your** program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copys and much more. All keys have convenient auto repeat (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features **all** of the following: complete 6809 instruction set; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile monitor is tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: $89.95**

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NFL — from Page 54

Don't try to use this procedure to guess winners for all games. It doesn't work. As the Power Factor Difference (PFD) becomes smaller, so does your ability to correctly pick the winner of a given game. As a rule I feel pretty comfortable guessing a winner if the PFD is 10 or greater. If the PFD is less than five, I would say the game is too close to call.

We looked at two other mid-season strategies that didn't work out. Maybe by discussing them we can save you some time.

Since the *NFL REPORT* ranks the teams by number of spread-wins, one strategy would be to say that the top spread winner will continue to win in the following week. It doesn't work! If you would have done this for Weeks 5 through 13, you would have correctly predicted only 48 percent of the games. That's about as good as a coin-toss.

Another way to look at the Spread Ranking each week is to say that the bottom teams will continue to lose next week. That doesn't work either. You would have been 11-for-26 or 42 percent correct with this strategy.

For the moment, it appears that the Power Factor Difference strategy is the best to follow. If anyone finds a better one, let me know, or give me the phone number where you can be reached in the Bahamas.

End-Season Strategy

(Weeks 14-16)

The Power Factor Difference strategy did not hold up well in the last three weeks of the season. It predicted only five out of the last 12 games selected.

A number of factors can be attributed to this poor performance. Player injuries were taking their toll. Our model doesn't see this. Some teams were startng to "pace" themselves for the playoffs. Some games were meaningless since neither team had a chance for the playoffs.

The end of the 1981 season played very strange. Philadelphia lost three out of their last four games. Dallas lost to the Giants in the last week of the season. San Francisco didn't cover the spread in a game with the Saints in Week 16. Clearly, some "coasting" does occur as the teams look ahead to the playoffs. For this reason we are not offering a specific end-season strategy, but we do intend to make more changes to our model in 1982 that should hep develop a strategy for the final weeks of the season.

For 1982, we are adding a Home Field Bonus. Some teams like Detroit, Tampa Bay, and San Francisco played very well at home and the present model will be modified to reflect this.

In addition, more calculations will be done using spread-win figures rather than straight-up wins since winning with the spread is what counts.

Picks

Here's the section you have been waiting for. This is where we use the 80C's IC's to predict the future. Have no fear, we have technology on our side! Anyway, based on our careful analysis of the 1981 season this is what we see.

In all cases these picks *include* the spread. We estimated what the spread might be for each game before making our selectins. Granted, this could cause some errors, but we don't think it will. Our selections were made using an average point-spread of 4.6 points per game. When the final spreads are established for each week, add all points given and divide by the number of games to calculate the average point spread. If you come out higher, I would look for more underdog wins. If lower, look for more wins by favorites.

Week One — Remember our Opening Season strategy? It says go with strong teams early in the season. Go with

favorites. Go with home teams. Talk about moons being in phase.

San Francisco, Cincinnati, and Philadelphia—all strong teams from last year, all will be favorites, all are playing at home for Week 1 of the season. I've got to go with these three for Week 1.

If you are looking for a fourth pick, I like Detroit at home against Chicago. Detroit played very well at home last year, 6-2 with the spread. I will be watching this game to see if that trend will continue.

Why not Dallas? Where is Dallas? They were strong last year. They are playing at home. They are playing at home for Monday Night football. You said, in Part I that the home team won 75 percent of the time on Monday Night football last year. Why not Dallas?

Dallas is an excellent example of a point I want to make. That's why I made such a big issue about it. Dallas is always a strong team, and last year they were great at home. Great is an understatement. Straight-up they were 8-0 last year at home. But when you consider the spread, it's a different story. Then they were 5-3 at home. That's why you need your 80C. It doesn't forget. It cranks out those numbers with no bias. True, Dallas may win, and cover the spread, but the model says the other games are more "predictable".

Week Two — This week is tough. All the big power teams that were playing home openers for Week 1 are on the road. That gives me an uneasy feeling when making picks for this week. Here goes. . .

I think the best pick is Miami at home to Baltimore. Baltimore, with a new coach, will have a very tough time playing Miami in their home opener.It's safe to say that Miami will win the game, but will they cover the spread? I think they will.

My next two picks might open some eyes. I like Tampa Bay, at home, over Washington. I favor Tampa Bay in this game for a surprising reason. Next to San Francisco, Tampa Bay had the best at-home performance against the spread in the 1981 NFL season. I'm going with that fact. I think they will be very tough at home during the early weeks of the season.

For my third pick I like Philadelphia over Cleveland, at Cleveland. The first two games for Philadelphia should say a lot about their performance for the rest of the 1982 season. In these games we will find out if they are on a strong comeback, or if their losses at the end of the '81 season were a sign of things to come. I think they will come back strong.

If you need a fourth pick for Week 2, here is a good one to watch. I pick the Jets over New England, at New England. Here's an interesting fact that my 80C told me about the Jets: They were the most powerful team in the NFL for the last half of the '81 season. They won more games by a wider margin than anybody. The early performance of the Jets will also be interesting in the 1982 season.

Week Three — By this week we can return to the same pattern we used in our Week 1 picks. Our top picks are San Francisco and Philadelphia. Both of these teams return home for Week 3. Like I said before, my 80C likes strong, home team favorites in the early weeks.

For my third pick I have to go with the Jets over Baltimore, at Baltimore. I think that Baltimore will improve this year, but if the Jets play like they did at the end of last season, they will be hard to stop.

My 80C's calculations really favor Cincinnati over Cleveland, at Cleveland, for the third week Monday Night game. I will take Cincinnati also, but as my last pick for the week. After all, Cleveland did beat Cincinnati once last year. This game, with the spread, should be close.

****

Well that's the picks. All 12 of them. You can find out how I did by watching the NFL with me.

—Continued on Next Page

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NFL — from Page 57

If you want to make your own picks, and don't have 32K or a printer, I will send you a copy of the *NFL REPORT* for week 16 of last year. Send $5.95 to Box 11224, Pittsburgh, PA 15238. Since it has all the statistics from last season, it will be helpful for the first few weeks of the '82 season. If you are going to use the programs that were published in Parts I and II, it's time to talk about how we collect date for them.

Data Collection

In Part I of this series we gave you a program that would produce the schedule of games for any week of the 1982 NFL season. It's time to show you how we use these schedule sheets to collect data. If you do not have our program, you can make your won schedule sheet by following our instructions.

Let's start with the first week of the season for an example. First, get a schedule of all games to be played that week, or generate one using our program from Part I. Next, check the sports page of your local paper, and find the "spreads" for the games to be played. These should appear about four or five days before the season begins. Using the spread information, identify the underdogs (those teams being given points) and add this information to your schedule sheet. I like to write them next to the team name on my schedule sheet.

If Pittsburgh as an Underdog, being given 5 points, I would show, "Pittsburgh Steelers +5" on my schedule sheet. Do this for all games to be played. If a game is some fractional number of points like +3½, I round-up to the next highest number, +4. At first I was cautious about doing this because I thought it might falsely affect the outcome of a game. There is no need to worry. For all 225 games played last year, this procedure only caused a conflict in one game, and I went back and rounded down instead of up to keep the outcome correct.

If the game is shown as "even", I record the letters "EV" beside both teams on my schedule sheet. There are usually about one or two "even" games every week so don't forget this procedure.

When you have completed the above, it's time to make your picks for the week. If you are using my schedule sheet, you will see a capital "G" and "S" on either side of the teams. This stands for Game and Spread. As you make your picks for the week, just circle the appropriate "G" and "S" for each team you think will win the Game and Spread.

The numbers at the top of the schedule indicate the number of games played that week. There is a space to the left of each number for you to keep track of how many games you have guessed correctly. There are also numbers at the bottom of the schedule for you to total the results for that week. If you are not using my sheet, you can make one and follow these procedures. Good luch with your picks!

Your next job is to collect the final scores for all games played. I either wtch the TV sports updates, or get them from the Monday morning paper. Next, I write each team score on my schedule sheet. I place the score for each team *between* their "G" and "S" on the sheet.

Finally, go over your schedule sheet and place an "X" over the "G" and "S" for the correct team that won the Game and Spread. Do this for all games played. You can tell very quickly how well you picked the winners. Any "G" or "S" that was circled, and has an "X", is a correct guess. Total your schedule sheet and record the numbers at the bottom.

You have now collected all data that will be needed by the *NFL REPORT* program. That's the one we gave you in Part II of this series. So now, it's time to learn how this software accepts data.

Data Entry

The *NFL REPORT* program that was listed in Part II also contained all data from the 1981 NFL season. Before we

—Continued on Page 60

Sugar Software

introduces...

Silly Syntax

a sensational and educational version of a popular party game for the TRS-80* Color Computer...

For 1 to 10 players. Load a story into the computer. The players are asked to supply a noun, verb, part of body, celebrity, etc. which the program uses to complete the story. The story, which is displayed when all words are entered, will be hilarious. Silly Syntax requires Extended Basic. For $19.95, you get a user guide and a tape containing the Silly Syntax game and 2 stories.

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introduces...

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Auto Run is a utility program for the TRS-80* Extended Basic Color Computer. It is used to add convenience and professionalism to your software.

Auto Run will create a tape which will consist of a machine language loader followed by your basic or machine language program. With this tape, a simple CLOADM command will load and start the loader which will then load and start your program.

You may design a title screen with the graphics editor which will display as your program loads. Also, you may record a vocal or musical introduction preceding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above &600 (the PCLEAR 0 page).

Software authors: The Auto Run prefix may be appended to your software products.

Auto Run is $14.95 and includes complete documentation and an assembly source listing.

Ohioans add 5.5% sales tax.
Add $1.00 per tape for postage and handling.
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Real lower case characters ■ Powerful text formatter
Works with any printer ■ Special MX-80 driver
Runs in 16K or 32K ■ Disk & cassette I/O

requires absolutely no hardware modifications

TELEWRITER

Telewriter is the powerful word processor designed specifically for the Color Computer. It can handle almost any serious writing job and it is extremely easy to use. It has all the advanced features you need to create, edit, store, format and print any kind of text. With Telewriter you can quickly produce perfect, finished copy for letters, reports, term papers, articles, technical documentation, stories, novels, screenplays, newsletters. It is also a flexible and efficient way to take notes or organize ideas and plans.

51 x 24 DISPLAY

The Color Computer is an incredibly powerful and versatile computer, but for text editing it has some major drawbacks. The small 32 character by 16 line screen format shows you too little of the text and, combined with its lack of lower case letters, bears little resemblance to the way text really looks on the page. Reverse video in place of lower case just adds confusion.

Telewriter eliminates these shortcomings with **no hardware modifications required.** By using software alone, Telewriter creates a new character set that has **real lower case letters**, and puts 24 lines of 51 characters on the screen. That's more on-screen characters than Apple II, Atari or TRS-80 Model III. That's more than double the Color Computer's standard display.

FULL SCREEN EDITOR

The Telewriter editor is designed for maximum ease of use. The commands are single key (or single key plus control key), fast, and easy to remember. There is no need to switch between insert modes and delete modes and cursor movement modes. You simply type. What you type is inserted into the text at the cursor, on the screen. What you see on the screen is always the current state of your text. You can move quickly through the text with one key cursor movement in all 4 directions, or press the shift key simultaneously for fast, auto-repeat. You can jump to the top or bottom of the text, the beginning or end of a line, move forward or backward a page at a time, or scroll quickly up or down. When you type past the end of the line, the wordwrap feature moves you cleanly to the next.

. . . one of the best programs for the Color Computer I have seen . . .
— Color Computer News, Jan. 1982

You can copy, move or delete any size block of text, search repeatedly for any pattern of characters, then instantly delete it or replace it with another. Telewriter gives you a tab key, tells you how much space you have left in memory, and warns you when the buffer is full.

FORMAT FEATURES

When it comes time to print out the finished manuscript, Telewriter lets you specify: left, right, top, and bottom margins; line spacing and lines per page. These parameters can be set before printing or they can be dynamically modified during printing with simple format codes in the text.

. . . truly a state of the art word processor . . . outstanding in every respect.
— The RAINBOW, Jan. 1982

Telewriter will automatically number pages (if you want) and automatically center lines. It can chain print any number of text files from cassette or disk without user intervention. You can tell it to start a new page anywhere in the text, pause at the bottom of the page, and set the Baud rate to any value (so you can run your printer at top speed).

You can print all or any part of the text buffer, abort the printing at any point, and there is a "Typewriter" feature which allows you to type straight to your printer. Because Telewriter lets you output numeric control codes directly (either from the menu or during printing), it works with **any** printer. There's even a special driver for the Epson MX-80 that lets you simply select any of its 12 fonts and do underlining with a single underline character.

CASSETTE AND DISK I/O

Because Telewriter makes using cassette almost painless, you can still have a powerful word processor without the major additional cost of a disk. The advanced cassette handler will search in the forward direction till it finds the first valid file, so there's no need to keep retyping a load command when you are lost in your tape. The Verify command checks your cassette saves to make sure they're good. You can save all or any part of the text buffer to disk or cassette and you can append pre-existing files from either medium to what you have in the buffer already.

AVAILABLE NOW

Telewriter turns your Color Computer into the lowest cost hi-power word processor in the world today. It runs in 16K or 32K (32K recommended) and is so simple you can be writing with it almost immediately. It comes with 63 pages of documentation and is fully supported by Cognitec. Telewriter costs $49.95 including shipping (California residents add 6% tax). To order, specify disk or cassette and send check or money order to:

Cognitec
704 Nob Ave.
Del Mar, Ca. 92014

Or call (714) 755-1258 weekdays 7 AM-4PM PST. We will gladly answer your questions.

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NFL — from Page 58

can use it for the 1982 season, two changes must be made.

First, change line 690 to read:

690 NEXT: PRINT#-2, CHR$(12): IF W=0 THEN END ELSE GOSUB 795

Next, we must remove all data for the 1981 season from the program. This can be done by doing the following: DEL 1500-2060. That will do the trick. Your program is now ready for the '82 NFL season.

The *NFL REPORT* generates its own data sheets. Each week of the season it will produce the REPORT for that week and the data sheet you will need for next week.

To generate the first data sheet for the season, load the *NFL REPORT* program on your 80C and type RUN. When it asks, "How many weeks are completed?", enter 0 (zero). The program will then generate a REPORT for Week 0 which will only contain a cover page and the data sheet you will need for Week 1.

When your schedule sheet for the first week's games is complete, you can begin to transfer information to your data sheet for Week 1.

Notice how the data sheet assigns the line numbers for the DATA lines. It starts with line 1500. Then, for each team, you must record the field it played on (H or A), what its score was, what the score of its opponent was, whether it Won, Lost or Tied (W/L/T) with the *spread*, the point spread for that game, whether the team ws an Underdog, Favorite, or Even (U,F,or E), and the team number of the opponent it played.

The next task is to type this information into your 80C. Before we do this, get the program listing I gave you in Part II. Look at line 1500 and see how the first seven lines of the data sheet turned into line 1500. You can read line 1500 out loud. Team number 1, played at home, scored 33 points, allowed 37 points, lost as a 9 point favorite, to team number 12, team 2, played at home, scored 14 points, etc.

The way I've structured the data sheet requires most information to be entered twice. This redundant data entry allows the *NFL REPORT* program to cross-check your data entry. After all, we do not want this program running with bad data.

ERROR MESSAGES

If you enter data like I do, you will have some typographical errors. When the REPORT program finds them, you will get one of the following error messages:

***DATA ERROR T(Y) — Y AT WEEK x AND TEAM y: The REPORT program knows it will see data for all 28 teams in the order shown on the data sheet. It loops through the data beginning with Team 1. It would then expect to see data for Team 5 on the fifth pass. If this does not happen, because you left a team out, or got out of numerical order, this error message will occur.

***TEAM y PLAYED ITSELF IN WEEK x: This error message will be generated it the Team Number and the Opponent Number are the same.

***DATA ERROR NO — 406 IN WEEK x: If you look at the data sheet under the Opponent Number column, you will see all team numbers from 1 to 28. If you add all the numbers from 1 to 28, they equal 406. If they don't, you left a number out, or you used the same one twice in that column.

***DATA ERROR ST — SO IN WEEK x: This means the sum of the Team Scores does not equal the sum of the Opponent Scores. You have the wrong score-pair in there somewhere.

***DATA ERROR HG — AG IN WEEK x: This means the number of Home Games does not equal the number of Away Game. You should have 14 H's and 14 A's in this column.

That's all the error messages. If your data can get through these checks it must be good for the program to use. You are ready! Bring on the NFL season.

Final Notes

The *NFL REPORT* program that was listed in Part II requires 32K and will not run from disk.

Every week you will be adding new DATA lines to your *NFL REPORT* program. Be sure and keep a backup copy. Trying to recover all that data due to a mid-season mistake would be a real job.

Finally, I want to publicly thank Charlie Roslund, Diane Storrick and Lonnie Falk for their discussion, reviews, support and comments. Without their valued input, this series would not have been possible.

I hope you have found this series both interesting and entertaining. From this side of the keyboard, this series has been fun. We enjoy football and our 80C. Maybe we've helped you to do the same. If we have, this series has been a sucess.

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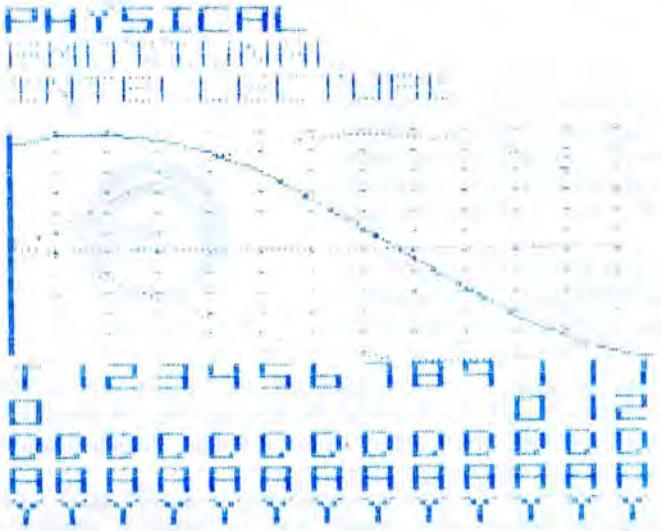
Software Review...

COLORHYTHM A Fine Hi-Res Biorhythm Program

It only takes a little creative programming to make Extended Color Basic live up to its potential as an excellent way to give graphic display of information. And *COLORHYTHM* is a good example of that sort of creative programming.

Yes, there are a great number of programs out to do biorhythms. The calculations lend themselves to a computer because they are complicated for humans to do but really very easy for a computer. So, frankly, it is not the getting of the information that is difficult—it is the presenting of it in an attractive and readable way.



COLORHYTHM's display is on the high resolution screen, and it gives you the wavy lines of emotional, intellectual and physical highs and lows in three colors across a grid starting with "today" and ending two weeks later. After you digest that, (and it is easy to do with the graphic presentation) you are switched back to the text screen for an analysis of just how you stand "today."

It is a nice package. One could easily add a screen print routine and have the chart print out on a line printer.

(Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110-1573, $9.95)

Coil Out The Interference

If you have some trouble with interference from your printer, disk drives or the like showing up on your TV set screen, try making a small coil with the first foot or two of the cable that leads from the back of your 80C to the RF modulator on your TV.

Its always best to keep cords and cables out of the way of one another, but sometimes you just can't. Even if you can, you might have some interference, but making a small circle with the TV cable may make things a lot better for you.

That coil has some sort of technical name, but no matter. In a whole lot of cases, it will work to reduce or eliminate stray electronic "noise" on your screen.

Software Review...

ALPHA-DRAW Routine Letters Graphic Screens

You can produce any of the characters on the 80C keyboard by simply loading a routine called *ALPHA-DRAW*.

This routine can be used from a BASIC program by simply calling it with a GOSUB statement. By using a couple of variables which the subroutine recognizes, you can set up any letters or characters you wish, have them start or stop where you wish and, for that matter, have them go up or down the screen. In addition, you can set both color and size by use of the options available to you in the DRAW command.

The subroutine comes to you with a demonstration program, and it is this program that really helps you understand what is going on. We wish the documentation were a little longer on the actual how-to of *ALPHA-DRAW*, but, other than that there is no problem with this software.

As an added bonus, you also get a tape merge program with *ALPHA-DRAW* that allows you to merge it (or any program or subroutine) with a "main" program. Since BASIC does not have a cassette merge, this is a real plus.

Although it requires you to do a small bit of setting up, this utility subroutine is easy to get the hang of and can add some extra dimensions to your programming.

(Custom Software Engineering, 807 Minuteman Causeway, Cocoa Beach, FL 32931, $8.95 plus $1 shipping)

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The Dragon's Byte

Dragons Are Nice Folks, Too. . .Almost All 1,440 Of Them!

16K
ECB

By Bill Nolan
***Rainbow* FRP Columnist**

(Mr. Nolan, an experienced Dungeonmaster in a popular fantasy-role playing game on a weekly basis, is the President of Prickly-Pear Software.)

Hello again, and welcome to August. Please take note of the brand new name at the head of this column. This was the Grand Prize winner in our "Name the Column" contest. Like I mentioned when the contest was announced, there were no other prizes in this contest. Just like when you fight a Dragon, you either win or you don't—there is no such thing as second place.

The winner of this Grand Prize (a $50 gift certificate from Prickly-Pear Software) was Todd Pittman of Chittenango, New York. Thanks, Todd. And, thanks, too, to the others who entered our contest.

This month I'm going to talk about Dragons. Those big guys are sure hard to fight (especially if you're first level), but they can be even harder for the Dungeon Master to deal with. Why?

Well, first of all, there are lots of different kinds. The evil Dragons come in red, blue, green, white, and black, while the good Dragons come in gold, silver, brass, bronze, and copper. The colors are for evil Dragons, and the metallics are for good. And that's not even counting the one-of-a-kind Dragons.

Naturally each type of Dragon has it's own special powers, number of hit dice, and other characteristics. Then there is the question of age. Some Dragons are babies, some are ancient, and the rest fall somewhere between. The age will certainly have an effect on the other characteristics of the Dragon, and all this must be calculated after you randomly determine the age by random dice roll.

But, we're not done yet. Not even close. How big is this Dragon? Well, each kind (remember all those colors and metals?) comes in three sizes—small, average, and huge—and this must be randomly decided. Don't forget to make the necessary adjustments to the other qualities after you check the size.

Where does all this leave us? Well, that's ten species, eight ages, and three sizes of Dragons. My trusty 80C says that we're up to 240 possible different Dragons. I guess that should cover it!

Not quite. Some dragons can talk and some can't—so we need another random dice roll to find out if this particular dragon is one of the gabby ones. The percentage of talking dragons is different for each species, so you better look it up. Now, if this dragon does talk, he may also have the ability to use spells. (Did I say *he*? Maybe we better check the sex on this dragon.) I hope you weren't expecting that the percentage of speaking dragons that can use spells would be the same for all kinds of dragons. Better look it up before you roll those percentile dice.

So, we had 240 kinds, but with two sexes that makes 480. Add speaking and non-speaking and you're up to 960. Consider magic use and you add another 480. (Why not add another 960? Remember, those 480 non-talking dragons have no chance to use magic.)

Unless I've forgotten something, it would take 1,440 dragons before you would have to create a duplicate. Sometimes I think that Role-Playing games can be complicated. If only we were through. Actually, though, we have what may be the hardest part to go.

When a character or party defeats the above-1,000 or so dragons, (Not hard—see below) an award of experience points is earned. How many points? It depends on the characteristics of the particular dragon in question. I suppose you could figure out each one individually, or you could write a table with 1,440 entries and just look it up. I didn't want to do that either, and, thus, the program below. Behold, *DRAGONROLLER!*

You decide which species of dragon you want, or let the computer do it—your choice. It will then correctly figure out age, size, sex, speaking ability and magic ability. It will also compute the experience point value of said dragon, which should save you some time. Maybe lots of time.

Once you have entered the program into your 80C, the on-screen prompts will lead you through the process of creating dragon after dragon.

You may have noticed I said that it wasn't too tough to defeat a dragon. Certainly, if you are a starting first level character, a Kobold will give you trouble. But no party thinks about killing dragons until they have a few levels behind them. If you take a party of six or so 4th or 5th level characters into a dragon's lair, you should whip all over the poor fellow. Sure, you may not all survive, but the treasure for those left would be incredible!

Everyone knows that dragons sleep on huge piles of thousands and thousands of gold coins, not to mention the jewels and magic items. Why, one good dragon lair can leave a character filthy rich. And the poor dragon, woebegone creature, really isn't able to guard all that treasure very well.

—Continued on Page 64

BASIC AID

AT LAST! Help for the Basic programmer. Basic Aid is an indispensable addition to the Color Computer. It will save you valuable time and effort. If you write or modify Basic programs you need Basic Aid.

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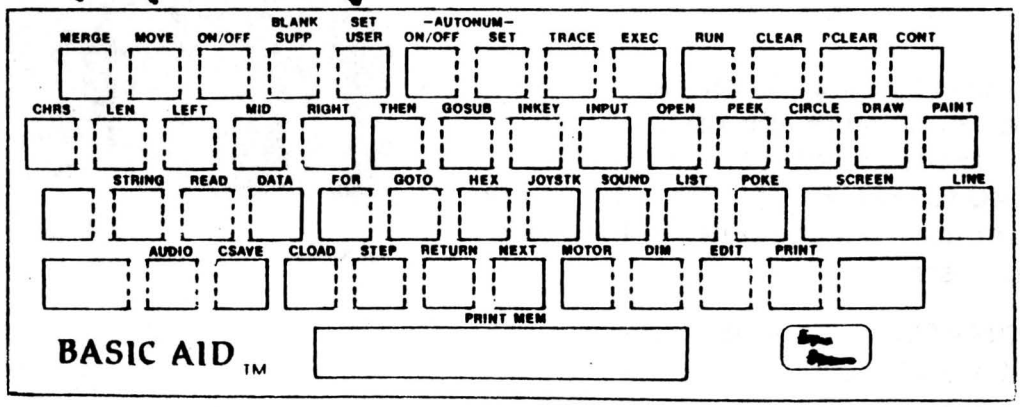

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DRAGON — from Page 62

When I play dragons in my dungeons, I make a few adjustments to even things out.

First, my dragons usually live in family groups. After all, these are very intelligent creatures, in most cases smarter than the players, and they enjoy the company of others like themselves.

Second, my dragons are *never* sleeping when the players come to kill them. I personally feel that the dragon's lack of alertness and tendency to be sleeping is only a rumor, and that they actually sleep very little.

Third, these are *very* intelligent beings, some near genius in I.Q. I play them by asking myself how I would react in a given situation. For example, if I think it would be in the best interest of the dragon to breathe on the party (and it usually is!) then the dragon will breathe. I do not roll dice to decide this, because the dragon is plenty smart enough to figure this out, so that's the way to play it.

In general, whenever a monster is intelligent, I find the most effective way to play them is to just put myself in their place, and have them do what I would do if I were them. This is what role-playing is all about, and I think the DM should role-play the monsters. Its really the only way to give them the even break which they so richly deserve.

Monsters, including my friends the dragons, get a lot of bad press. The standard party of players will head out at the drop of a hat to slay the terrible, horrible, evil monsters in their lair.

Meanwhile, back at the lair, what are the terrible, horrible, evil monsters doing? Minding their own business, that's what. You know, eating, raising their little families, counting their hard-earned treasure. Stuff like that.

The scenario I see goes like this: A papa Red Dragon, just home after a long hard day at work, is sitting down to dinner with Mama and the kids when his loving home is invaded! Suddenly fireballs are flying, arrows are slaying, the kids are screaming. Mama dies beside him. Then a Vorpal Sword named Dragonslayer cuts off his head. What a way to end a day. I mean, this is really an Excedrin headache.

Then, to top it off, all these vandals loot the place, carry off the inheritance, smash the furniture and, once back in town, brag about it all to their friends. The only people happy about this are the player-vandals themselves. Oh, and of course the maiden who would have been dinner for the dragons. Don't you guys ever feel sorry for the monsters?

There is one thing I have noticed. If I mention to a group of players that there is a dragon around, they are on their way to kill it. But, if the talk turns to demons in the vicinity, the players head out of town in another direction.

Next month I will discuss the much-maligned demon, give you a program, and some ideas on how to use demons in your next campaign. The Succubi are my personal favorites. Delightful ladies!

Until then, if you have any questions, write me at Prickly-Pear Software, 3510 S. Randi Place, Tucson, AZ 85730 or call (602) 886-1505.

```
5 CLEAR:CLS0:PRINT@106,"RANDOMIZ
ING";:GOTO 9000
10 CLEAR:XX=229:GOSUB 10000:PRIN
T@40,"DRAGON SELECTOR";:PRINT@71
,"INPUT YOUR CHOICE";:PRINT@104,
"1. RED";:PRINT@136,"2. GREEN";:
```


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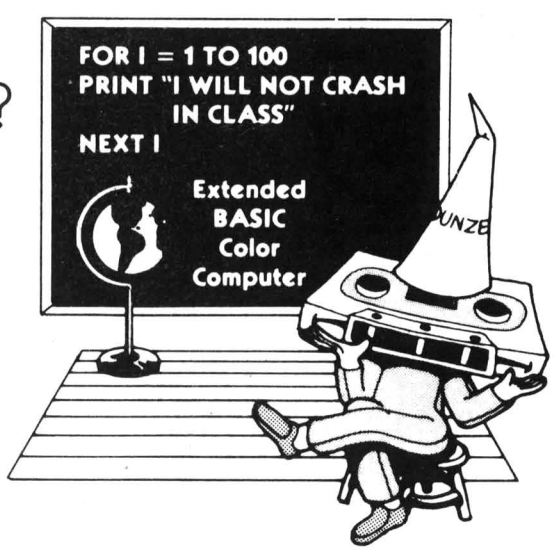

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PRINT@168,"3. BLUE";:PRINT@200,"
4. BLACK";:PRINT@232,"5. WHITE";
20 PRINT@264,"6. GOLD";:PRINT@29
6,"7. SILVER";:PRINT@328,"8. COP
PER";:PRINT@360,"9. BRONZE";:PRI
NT@391,"10. BRASS";:PRINT@423,"1
1. RANDOM";:PRINT@457,"";:INPUT
D:SOUND 150,1:IF D<1 OR D>11 THE
N CLS:GOTO 10
30 IF D=11 THEN D=RND(10)
32 R=RND(8):IF R<3 THEN S=1:S$="
SMALL":GOTO 35
33 IF R=8 THEN S=3:S$="HUGE":GOT
O 35
34 S=2:S$="AVERAGE"
35 A=RND(8):IF A=1 THEN A$="VERY
 YOUNG" ELSE IF A=2 THEN A$="YOU
NG" ELSE IF A=3 THEN A$="SUB-ADU
LT" ELSE IF A=4 THEN A$="YOUNG A
DULT" ELSE IF A=5 THEN A$="ADULT
" ELSE IF A=6 THEN A$="OLD" ELSE
 IF A=7 THEN A$="VERY OLD" ELSE
A$="ANCIENT"
40 ON D GOTO 500,1000,1500,2000,
2500,3000,3500,4000,4500,5000
500 XX=191:GOSUB10000:PRINT@66,S
$;" RED DRAGON";:PRINT@98,A$;"
 ";:HD=8+S:HP=HD*A:PRINTHD;"HIT
DICE";:GOSUB 8070
510 PRINT"    AC -1";:PRINT@162,"
TREASURE TYPE H,S,T";:PRINT@194,
"3 ATTACKS  1-8/1-8/3-30";
520 PS=76:PM=41:GOSUB 8090
530 EA=EA+2:SA=2:IF A>4 THEN SA=
SA+2
540 ON S GOSUB 8040,8050,8060:GO
SUB 8080:GOSUB 8200:GOTO 9000
1000 XX=134:GOSUB10000:PRINT@66,
S$;" GREEN DRAGON";:PRINT@98,A$;
"    ";:HD=6+S:HP=HD*A:PRINTHD;"H
IT DICE";:GOSUB8070
1010 PRINT"    AC 2";:PRINT@162,"
TREASURE TYPE H";:PRINT@194,"3 A
TTACKS  1-6/1-6/2-20";
1020 PS=45:PM=20:GOSUB 8090
1030 EA=EA+1:SA=1:IFA>4 THEN SA=
SA+2
1040 ON S GOSUB 8020,8030,8040:G
OSUB 8080:GOSUB 8200:GOTO9000
1500 XX=175:GOSUB10000:PRINT@66,
S$;" BLUE DRAGON";:PRINT@98,A$;"
    ";:HD=7+S:HP=HD*A:PRINTHD;"HI
T DICE";:GOSUB 8070
1510 PRINT"    AC 2";:PRINT@162,"
TREASURE TYPE H,S";:PRINT@194,"3
 ATTACKS  1-6/1-6/3-24";
1520 PS=60:PM=30:GOSUB 8090:EA=E
A+1:SA=1:IF A>4 THEN SA=SA+2
1530 ON S GOSUB 8030,8040,8050:G
OSUB 8080:GOSUB 8200:GOTO 9000
2000 XX=200:GOSUB10000:PRINT@66,
S$;" BLACK DRAGON";:PRINT@98,A$;
"    ";:HD=5+S:HP=HD*A:PRINTHD;"H
IT DICE";:GOSUB 8070
2010 PRINT"    AC 3";:PRINT@162,"
TREASURE TYPE H";:PRINT@194,"3 A
TTACKS  1-4/1-4/3-18";
2020 PS=30:PM=10:GOSUB 8090:EA=E
A+1:SA=1:IF A>4 THEN SA=SA+2
2030 ON S GOSUB 8010,8020,8030:G
OSUB 8080:GOSUB 8200:GOTO9000
2500 XX=207:GOSUB10000:PRINT@66,
S$;" WHITE DRAGON";:PRINT@98,A$;
"    ";:HD=4+S:HP=HD*A:PRINTHD;"H
IT DICE";:GOSUB 8070
2510 PRINT"    AC 2";:PRINT@162,"
TREASURE TYPE E,O,S";:PRINT@194,
"3 ATTACKS  1-4/1-4/2-16";
2520 PS=20:PM=5:GOSUB 8090:EA=EA
+1:SA=1:IF A>4 THEN SA=SA+2
2530 ON S GOSUB 8000,8010,8020:G
OSUB 8080:GOSUB 8200:GOTO 9000
3000 XX=159:GOSUB10000:PRINT@66,
S$;" GOLD DRAGON";:PRINT@98,A$;"
   ";:HD=9+S:HP=HD*A:PRINTHD;"HI
T DICE";:GOSUB 8070
```

—Continued on Page 67

HARMONYCS

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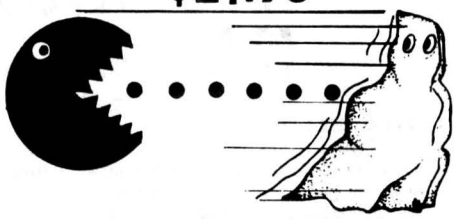

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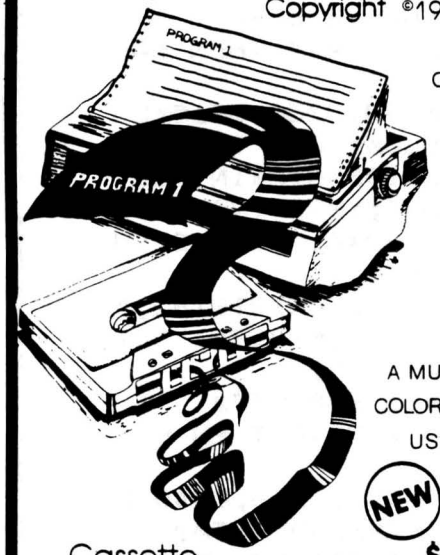

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DRAGON — from Page 65

```
3010 PRINT"    AC -2";:PRINT@162,
"TREASURE TYPE H,R,S,T";:PRINT@1
94,"3 ATTACKS  1-8/1-8/6-36";
3020 PS=90:PM=101:GOSUB 8090:EA=
EA+2:SA=2:IF A>4 THEN SA=SA+2
3030 ON S GOSUB 8050,8060,8060:G
OSUB 8080:GOSUB 8200:GOTO 9000
3500 XX=216:GOSUB10000:PRINT@66,
S$;" SILVER DRAGON";:PRINT@98,A$
;"    ";:HD=8+S:HP=HD*A:PRINTHD;"
HIT DICE";:GOSUB 8070
3510 PRINT"    AC -1";:PRINT@162,
"TREASURE TYPE H,T";:PRINT@194,"
3 ATTACKS  1-6/1-6/5-30";
3520 PS=75:PM=75:GOSUB 8090:EA=E
A+2:SA=2:IF A>4 THEN SA=SA+2
3530 ON S GOSUB 8040,8050,8060:G
OSUB 8080:GOSUB 8200:GOTO 9000
4000 XX=255:GOSUB10000:PRINT@66,
S$;" COPPER DRAGON";:PRINT@98,A$
;"    ";:HD=6+S:HP=HD*A:PRINTHD;"
HIT DICE";:GOSUB 8070
4010 PRINT"    AC 1";:PRINT@162,"
TREASURE TYPE H,S";:PRINT@194,"3
 ATTACKS  1-4/1-4/5-20";
4020 PS=45:PM=40:GOSUB 8090:EA=E
A+1:SA=1:IF A>4 THEN SA=SA+2
4030 ON S GOSUB 8020,8030,8040:G
OSUB 8080:GOSUB 8200:GOTO 9000
4500 XX=245:GOSUB 10000:PRINT@66
,S$;" BRONZE DRAGON";:PRINT@98,A
$;"    ";:HD=7+S:HP=HD*A:PRINTHD;
"HIT DICE";:GOSUB 8070
4510 PRINT"    AC 0";:PRINT@162,"
TREASURE TYPE H,S,T";:PRINT@194,
"3 ATTACKS  1-6/1-6/4-24";
4520 PS=60:PM=60:GOSUB 8090:EA=E
A+1:SA=2:IF A>4 THEN SA=SA+2
4530 ON S GOSUB 8030,8040,8050:G
OSUB 8080:GOSUB 8200:GOTO 9000
5000 XX=147:GOSUB 10000:PRINT@66
,S$;" BRASS DRAGON";:PRINT@98,A$
;"    ";:HD=5+S:HP=HD*A:PRINTHD;"
HIT DICE";:GOSUB 8070
5010 PRINT"    AC 2";:PRINT@162,"
TREASURE TYPE H";:PRINT@194,"3 A
TTACKS  1-4/1-4/4-16";
5020 PS=30:PM=30:GOSUB 8090:EA=E
A+1:SA=1:IF A>4 THEN SA=SA+2
5030 ON S GOSUB 8010,8020,8030:G
OSUB 8080:GOSUB 8200:GOTO9000
8000 EP=90+5*HP+40*SA+75*EA:RETU
RN
8010 EP=150+6*HP+75*SA+125*EA:RE
TURN
8020 EP=225+8*HP+125*SA+175*EA:R
ETURN
```

—Continued on Page 69

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COLOR COMPUTER DISK SYSTEM

We offer a complete disk drive interface system for the color computer, featuring the Tall Grass Technologies Double Density, buffered disk controller card. The disk interface board plugs into the color computer expansion socket and provides for doubling the storage capacity of single density type disk drives by using GCR encoding / decoding techniques. Power may be taken internally from the system or from an external power supply (not normally required even with piggyback 4116's installed)..This controller will support up to 4 single/double density, single/double sided 5 & 1/4 inch disk drives. These include Shugart 400 series, Siemens 82, TEAC 50 series, Pertec FD200, MPI B51/52/91/92, Tandon and others. The controller uses standard 10 sector diskettes and does not read or write the soft-sectored IBM style formats used by TRS-80 or FLEX systems. Two reasons for not using a soft sectored system are cost and reliability.

The Tallgrass double density format offers more margin for worn diskettes, dirt etc. and less expensive single density disk drives & diskettes. All you need to add to have a complete disk system is a disk drive / cable.

DISK OPERATING SYSTEM (DOS)

The Disk Operating System for the Tallgrass Technologies Disk controller (CCMD+9) is a full featured "BASIC" compatible operating system. It is fully integrated with the ROM basic system already in the color computer and automatically is initialized upon system power on much the same as the R.S. disk system does. But there is a big difference between that disk system and CCMD+9. First of all we support any mix of 35, 40 or 80 track single or double sided disk drives, which allows a minimum of 4 times the storage capacity of the "other" disk system. We also make far better use of the disk storage space by using sector allocation for each file instead of the granual method of 8 sector blocks which can waste anywhere from 1 to 7 sectors for each file on the disk. For example, on their DOS, if 5 files each required only 2 sectors there would be 40 disk sectors allocated, a waste of 30 disk sectors or almost 4 "granuals". This is not the case in our disk system, only the required number of sectors would be used.

Many other disk systems using a sector allocation system have a problem with file fragmentation and excessive seek time after a disk is used over and over adding and deleting files until it becomes so bad that the disk must be re-formatted to correct the problem. With CCMD+9 this is not the case, as files are deleted the disk space is automatically repacked to help keep files from being fragmented and decrease access time.

The DOS is contained in a ROM on the disk controller the same as the R.S. disk system so you don't have to "bootstrap" the DOS off of a disk and it doesn't get clobbered easily by a runaway program as most ram based systems do. The DOS does "NOT" require Extended Basic and will run on a 4, 16 or 32K system without any modifications. CCMD+9 uses approximately 1K of ram for the disk system which is taken from the top of memory, this allows all previously purchased tape software to function with the disk system, this is not so with the R.S. disk system.

CCMD+9 supports both Basic and Machine language programs. It is easily accessible to the beginner or advanced machine language programmer with easy to use and well documented entry points to perform disk as well as screen/printer/keyboard input & output. It includes 10 disk file functions to open, close, read/write random or sequential files, read specific sector of file, flush sector buffer to file, close & rewind file (re-open) and process disk system errors. The screen/printer/keyboard I/O functions include: input character, output character, output text string, output carriage return, output 2/4 hex characters, output space character and read/write single disk sector.

The "BASIC" interface system allows Basic and Basic programs to communicate with the disk system much the same as the R.S. disk system does with a few added features. It includes both Direct and Indirect basic commands, Direct commands can be executed any time and Indirect commands are contained with "Basic" programs. The Direct commands include: LOAD or SAVE (binary/ASCII basic program disk file), CHAIN (load & execute basic program) and CDOS "disk command". The "CDOS command allows you to execute a specific disk command from the free standing disk system, these include: LOAD/SAVE machine language or memory file, REMOVE one or more disk files, CHANGE disk file name, CHECK disk file for errors, ANALYZE disk directory, STRACK set tracks & sides for disk drive, SCMP set compare on/off, RUN load & execute machine language disk program. GOTO execute machine language program at specified address, and NEW initialize disk. If the "CDOS" command is executed without any command following control is passed to CCMD+9 where any of the previously mentioned commands can be executed directly thus providing total control of the entire system. The command system is easy to learn and remember with a minimum of effort on the users part. The BASIC interface system was designed to be compatible with the existing I/O commands used with tape files for easy conversion and upgrading to disk. When using Basic disk files up to 9 files can be active at once with all disk file memory allocation being done automatically at run time, you don't have to reserve file space as with the R.S. disk system. The Indirect basic commands include: Open, Print, Input, Line Input (ext. Basic), EOF, Rewind, Close, Print Using (Ext. Basic), these all function in the same manner as basic tape file I/O.

CCMD+9 has one other unique feature not found in most disk systems. Eash disk initialized by the system is assigned a disk label which can be used instead of a disk drive number, the system will automatically locate which drive the diskette is on and use it accordingly. This can be very usefull in basic programs which use files on multiple disks, you don't have to worry which disk belongs in which drive.

Part of the power and flexibility of CCMD+9 lies in the Disk Utility System which allows the system commands to be greatly expanded by adding utility or transient disk commands. These commands are automatically handled by the system so as not to overwrite Basic programs in memory and can even be called by a Basic program in some cases. For example you can perform a disk copy or backup while still preserving a basic program currently in memory, no other system that we know of has this ability. We currently have a list of utilities available and will be adding to it constantly to improve the system.

SOFTWARE SUPPORT

This disk system is the most recent one to enter the color computer disk market and is currently the only one with any disk software to support it. There should be no problem in the future with a lack of software for this system because, it is extremely easy to interface software to. We currently have available for the disk system: a Disk Assembler which allows files larger than memory to be assembled, a Disk Text Editor which makes writing Basic and Assembler programs easy and also will edit files larger than memory, a Disk Text Editor/Processor (WORD PROCESSOR) "TEXTPRO1 which is easy to learn and extremely powerful for its price range, TEXTPRO II is an advanced version with expanded features: programmable tabs, 3 line processable headers, decimal/center/right justify/ horizontal tabs, keyboard input processing and more. A Disk Disassembler/Source generator, a Disk system monitor which includes all of the "TRSMON" monitor commands & has access to all of CCMD+9 disk commands & automatically locates itself at the top of memory to stay out of the way, and a full compliment of disk utilities. The utility disk includes: full disk backup, build disk text file from keyboard, 24 hour screen clock, single or multiple disk file copy, text file executive processor, ASCII/HEX file dump/list/map utility, ASCII file lister/printer, and a disk relabel utility. All at prices far below what other disk system software sells for.

TG-99 Disk Controller w/CCMD+9 DOS ROM	**$159.95**
CCASM9 Disk Assembler	**$ 34.95**
CCEDT9 Disk Text Editor	**$ 24.95**
CCDISS Disk Disassembler Source Generator	**$ 29.95**
CCTPR1 Disk Text Editor/Word Processor TEXTPRO 1	**$ 39.95**
CCTPR2 Disk Text Editor/Word Processor TEXTPRO 2	**$ 59.95**
CCUTLY Disk Utilities	**$ 19.95**
DOSMON Disk system monitor/utility program	**$ 29.95**
CGAME1 HI-RES Graphic games Space Invaders, Meterioids, Space War	**$ 49.95**
CGAME2 Mixed games Battle Fleet, Space Traders, Adventure	**$ 39.95**

SPECIAL LIMITED OFFER

We have a complete disk system package available that includes: a 40 track single sided disk drive with power supply, case, 2 drive cable, TG-99 controller w/CCMD+9 and a disk containing CCUTLY disk utilities and CCEDT9 disk editor all assembled and tested for $499.00
Additional 40 track drive with power supply & case tested. $300.00

For double sided drives add $100.00 per drive. Add $5.00 per drive for shipping, NO COD's on disk drives or disk system special. Shipping for disk controller add $2.50, for Disk software only add $1.00. Visa & M/C add 3% (this is what the bank charges us).

Manufactured under license from Tall Grass Technologies.

CO RESIDENT EDITOR/ASSEMBLER

Co-resident Editor/Assembler that will allow the user to create, edit and assemble machine language programs for the color computer. The editor portion of the program is similar to the text editor in TEXTPRO. The assembler will output machine object code to either cassette tape in a 'CLOADM' readable format or directly to memory for direct execution. The assembly listing can optionally be output to the printer connected to the RS-232/Printer port on the color computer. All errors are displayed with a full text message for easy identification. The assembler supports the full compliment of the M6809 instruction set and also will cross assemble 6800 source code to produce M6809 compatible object code.

CO-RES9 $39.95

SYSTEM MONITOR

TRSMON is a 2K system monitor program that will allow you to explore the workings of the color computer. It features 9 debuging commands, tape load and save compatible with Basic "CLOADM", up/down load via RS232 port, terminal package that allows the color computer to be used as a terminal at baud rates up to 9600 baud and a printer driver to direct display output to the printer for memory dumps, disassemblies etc. The program is position independent so it can be moved anywhere within the system memory. A very powerful tool at a very reasonable price. Commands Include:

Memory examine & change, Goto defined address, Load Tape program (w/offset), Load Motorola S1-S9 file (RS232), Save Tape program, Send memory file S1-S9 (RS232), Set and/or display breakpoints, Remove one or all breakpoints, Define printer/terminal baud rate, Set and/or display registers, Dump memory in Hex & Ascii format, Disassemble memory file, Terminal mode & optional buffer, Fill memory, Move block of memory, Find memory byte sequence, Exit monitor to Basic, Exit monitor to Rom Pack ($C000), Re-initialize monitor, Direct output to printer.

TRSMON ON TAPE	**$19.95**
TRSMON on 2716 Eprom	**$34.95**

8K COLOR RAM/EPROM CARTRIDGE HOLDS 4-2716 EPROM or RAM	**$24.95**
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MOTOROLA 6809 PROGRAMMERS MANUAL	**$11.95**
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TEXTPRO
TEXT EDITOR/PROCESSOR

TEXTPRO is a complete text editor & text processing program for the Color Computer. The program includes our powerful full function text editor plus the added features of a text processor. The entire program utilizes only 6K of memory space including the tape, screen and keyboard buffers. It is extremely fast in editing and processing text files and is compatible with Basic ASCII formatted tape files.

The Editor itself includes 24 commands including string search & replace; line and automatic line edit modes which allow you to insert, delete, change or add characters. Automatic line editing allows you to skip forward and backward for checking and editing, all screen editing immediately updates the screen so you know exactly what you are doing at all times. The Editor also has commands to move or copy single lines or blocks of text from one place to another. Some of the other commands include Tape load, save and append; Automatic line numbers, delete line, set input line length and printer output.

The Text Processor includes 29 commands for formating the output, some of them include: page length, left margin, top & bottom margin, line length, justify & fill modes, page heading, center line, double width print, margin control, single, multiple & special indent modes, test lines left on page, display & input from keyboard and even special control codes can be sent to the printer for different print densities etc. It even has a repeat command with a next command to redo all of or a portion of the file as many times as needed. TEXTPRO will turn your color computer into a full fledged text processing machine at a price you won't believe. Available on 'CLOADM' compatible cassette.

SPECIAL INTRODUCTORY PRICE $29.95
RS. DISK VERSION $49.99

DATAPACK
DATA COMMUNICATIONS PACKAGE

DATAPACK is a Terminal package program for the COLOR COMPUTER, allowing you to use the color computer as a buffered computer terminal through a modem to a time sharing network or as a direct connect terminal to another computer system at rates up to 9600 baud. This program is more than a standard "Videotext" type program in that it will allow you to save data stored in the buffer either to cassette tape, or output a hard copy to a printer. The data buffer is automatically set to the maximum size of your system memory when entered to allow maximum space for saving data. The program includes features to send control codes and to enable or disable keyboard echo. When the terminal mode is exited the contents of the buffer may be viewed on the screen or saved to tape for later loading. Also the RS-232 port can be used to plug your printer back in for sending the screen buffer to the printer. An additional feature is the ASCII format that is used on tape is compatible with the CER-COMP Text Editor program and BASIC, enabling you to edit or delete unwanted information.

PRICE: $24.95 ON CASSETTE
RS. DISK VERSION $49.95

5566 Ricochet Avenue
Las Vegas, Nevada 89110

CER-COMP
(702) 452-0632

All Orders Shipped From Stock
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DRAGON — from Page 67

```
8030 EP=375+10*HP+175*SA+275*EA:
RETURN
8040 EP=600+12*HP+300*SA+400*EA:
RETURN
8050 EP=900+14*HP+450*SA+600+EA:
RETURN
8060 EP=1300+16*HP+700*SA+850*EA
:RETURN
8070 PRINT@129,HP;"HIT POINTS";:
RETURN
8080 PRINT@257,EP;"EXPERIENCE PO
INTS";:RETURN
8090 R=RND(100):IF R<PS THEN PRI
NT@226,"SPEAKS";:R=RND(100):IF R
<PM THEN EA=EA+1:PRINT" - MAGIC
USE";
8095 RETURN
8200 R=RND(2):IF R=1 THEN PRINT@
290,"MALE"; ELSE PRINT@290,"FEMA
LE";
8210 RETURN
9000 PRINT@453,"HIT ANY KEY FOR
MENU.";:K$=INKEY$
9010 K$=INKEY$:IF K$="" THEN XX=
RND(0):GOTO 9010
9020 SOUND 150,1:GOTO 10
10000 CLS:FOR X=1024 TO 1055:POK
E X,XX:POKE X+480,XX:NEXT:FOR X=
1056 TO 1504 STEP 32:POKE X,XX:P
OKE X-1,XX:NEXT:RETURN
```

Make The Color Computer Live Up To Its Name

For those of you who would like to see the "Color" Computer live up to its name, here are a couple of short programs I have had some fun developing and working with.

```
 10 PMODE4,1:PCLS:SCREEN1,1
 20 A=1536:B=1
 30 FOR X=A TO (A+736) STEP 32
 40 POKE X,B: NEXT
 50 A=A+1: B=B+1
 60 IF B=33 OR B=65 OR B=97 OR B=129 OR B=161 OR
B=193 OR B=225 OR B=256 THEN 70 ELSE 30
 70 IF B>=256 THEN 80 ELSE 75
 75 A=A+736:GOTO 30
 80 FOR X=1 to 3000: NEXT
 90 PMODE3,1: SCREEN 1,1: FOR X=1 TO 3000: NEXT
 100  SCREEN 1,0: FOR X=1 to 3000: NEXT
 110  PMODE 4,1: SCREEN 1,0: FOR X=1 TO 3000:
NEXT
```

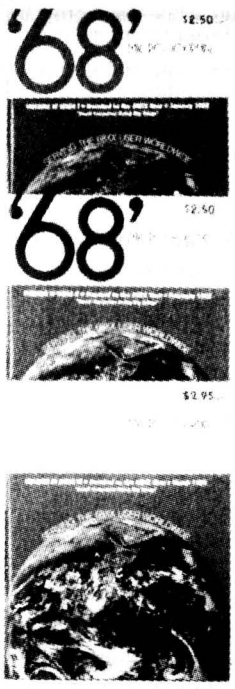
—Continued on Page 71

™TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

> There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

NOTE: This and other interesting and needed articles for the Radio Shack TRS-80 color computer™ are being included monthly in 68 Micro Journal—The Largest specialty computer magazine in the world!



68 MICRO JOURNAL

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** Sample issue - $3.50

68 Micro Journal™ was established with one objective in mind; to provide a Magazine **FOR** 68xx Users **BY** 68xx Users. Because of a strict advertiser policy, **68 Micro Journal™** has gained a strong following WORLDWIDE because the reader KNOWS what he is getting when purchasing from a **68 Micro Journal™** Advertiser. It has gained a strong user following because most of the material published is contributed BY USERS, and, therefore, is relevant to the Users needs.

Currently, and even before the Color Computer™ hit the stores, **68 Micro Journal™** was devoting more space to the TRS-80C Color Computer™ and information concerning the Motorola 6809 (which is the CPU in the Color Computer™) than ANY OTHER Computer Magazine. Examples include:

REVIEWS of the three major Disk Control Systems for the Color Computer™, most of the Monitors, Assemblers, and Disassemblers, Word Processors and Editors, "Terminal" Programs (for use with Modems, Communications with other Computers, etc.), and of course, Games.

HINTS for Expanding Memory, Power Supply Cooling, repairing sticky keyboards, disabling the ROM PAK "Take Over", hooking up to Printers, etc.

DISCUSSIONS of the 6883 Synchronous Address Multiplexer, using the Color Computer™ with 64K and 96K memory (which it is ALREADY capable of handling), thoughts on Programming, etc.

I suggest that you subscribe to **68 Micro Journal™**, SOON, as many back issues are sold-out.

We still, and will continue to, lead in the type information you need to **FULLY UTILIZE** the **POWER of the 6809 in the Radio Shack TRS-80 Color Computer™.**

Bob Nay
Color Computer Editor

The Platinum Worksaver©

...Programming Made Easy

FULL SCREEN EDITING OF BASIC PROGRAMS

With the PLATINUM WORKSAVER'S editor, there's no more counting the numbers of characters to delete or change, or wondering if you deleted too many or too few. You see the whole line as it's edited. Changes, deletes and inserts are automatic and the cursor can be moved anywhere on the screen.

FULL SCREEN EDITING OF NUMERIC AND STRING ARRAYS

But that's only the beginning! The editor (Written in machine language) also comes with a short, two line BASIC subroutine that will allow you to use the full screen editor on your numeric and string arrays. This is the springboard you need for developing your own VisiCalc™ or word processor.

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Now you can write, enter and change programs easily, but what about debugging? This is the frustrating, time consuming aspect of programming and frankly, the Color Computer doesn't help you much . . . you have to start the program over each time you make a change. But not with the PLATINUM WORKSAVER!! With it you can change, delete, add and rearrange or join lines. The special reserved key is excellent for copying or moving parts of lines to other lines . . . plus, you can even LOAD A WHOLE NEW PROGRAM without disturbing the data you've created.

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We've solved another Color Computer weakness. Press a control key and letters J, K, L, U, I, O, P become number keys 1-7. Numbers 8-0 remain in their normal positions. The key pad numbers are clearly labeled on the overlay.

A COLOR COMPUTER* MACHINE LANGUAGE ENHANCEMENT PACKAGE THAT PROVIDES:

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- Best value per dollar than any other enhancement package available.

With the Platinum Worksaver©, programming time and hassle can be cut by 50%. You'll spend less time typing, more time being creative with your Platinum Enhanced 16K Color Computer!

LOOK WHAT JUST $30 CAN DO FOR YOUR 16K COLOR COMPUTER:

Platinum Enhanced 16K Color Computer	vs.	Regular 16K Extended Color Computer
• Relocate, join, duplicate individual and unique sets of lines at the push of a button		• **Retype** entirely any lines to be moved or joined
• Create the following using only 31 keystrokes: CLS:A$-String$ (15"") + MID$ (CL$, 6, 2). To change the − symbol to = requires only 3 keystrokes!!!!		• **Type** that line using 47 keystrokes. To change the symbol, **Backspace** and **retype** using 33 more strokes!
• Retain the sequence of commands in temporary memory with special reserved key		• **Retype** lost lines!
• One keypush and the right side of the keyboard converts to a numeric Keypad		• **Stretch** those fingers!
• Correct bugs while your program is running, without losing data.		• Oops! **Lost** data! **Retype, Reload** and **Save** data while swearing a lot.
• Edit programs, data and strings using the full screen editor.		• NO CAN DO!

THE PLATINUM WORKSAVER INCLUDES:

- *Enhancement program, including a sample array Editor, on a high-quality Agfa Cassette*
- *Fully labeled acetate keyboard overlay*
- *Complete instructions*
- *Loads in seconds, takes less than 2K*

FEATURE	Full Screen Editing	Dynamic Editing	Single Function Keys	Numeric Keypad	Price
Platinum Enhanced 16K Color Computer	yes	yes	yes	yes	$ 629.**
TRS-80* Model III	no	no	no	yes	$ 999.
TRS-80* Model II	no	no	no	yes	$3450.

The PLATINUM WORKSAVER costs $30.00 plus $3.00 S&H (NY residents add 7% tax). To order write:

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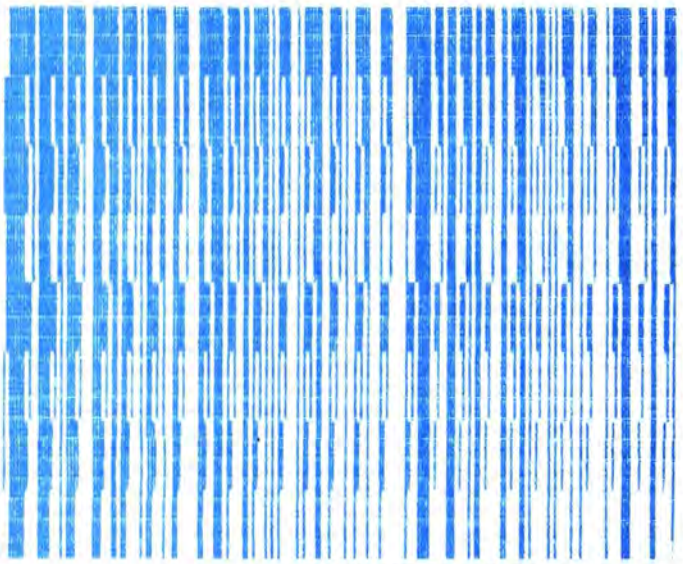
**$30.00 plus $599, suggested price for 16K Color Computers (we do not sell the computers).

NAME — from Page 69

After trying the Listing above, pick any number between 1 and 255 and put it in Line 20 of the program below:



Portion of Graphic Screen Display

```
10 PMODE 4,1: PCLS: SCREEN 1,1
20 N= (put your number here)
30 FOR X=1536 to 7680
40 POKE X,N: NEXT
50 FOR Y=1 TO 90 STEP 5
60 CIRCLE (128,96),Y,0: NEXT
70 GOTO 70
```

To try another number, just PCLEAR 4 and enter it in Line 20 as before.

—Bill Lopes

TREK80C

The classic computer game written for the Color Computer. A real-time game with moving Klingons and action graphics. Watch your Phaser blasts turn Klingon battle cruisers into space debris. Watch the Klingon move out of your path as you position for a Photon torpedo shot. Watch your screens fall during battle. Don't leave your station or the Klingons may destroy you. May the FORCE be with you!
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Color Computer News

Are you tired of searching the latest magazine for articles about your new Color Computer? When was the last time you saw a great sounding program listing only to discover that it's for the Model I and it's too complex to translate? Do you feel that you are all alone in a sea of Z-80's? On finding on ad for a Color Computer program did you mail your hard earned cash only to receive a turkey because the magazine the ad appeared in doesn't review Color Computer Software? If you have any of these symptoms you're suffering from Color Computer Blues!

But take heart there is a cure!

It's COLOR COMPUTER NEWS.

The monthly magazine for Color Computer owners and only Color Computer owners. CCN contains the full range of essential elements for relief of CC Blues. Ingredients include: comments to the ROMS, games, program listings, product reviews, and general interest articles on such goodies as games, personal finances, a Kid's page and other subjects.
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PRINT #-2, — from Page 6

need your support and help. We're trying to do our best and hope you will agree that, sometimes, we succeed.

We hope you noticed the new logo in six colors. I forgot to mention last month that it was the work and creation of one Jim "Spider" Cleveland. Thanks, Jim.

As to what's ahead for *the RAINBOW*, next month will be the debut of our special "Education Issue." And, you will see a notice elsewhere that I messed up (badly) on the deadline for the Adventure contest, so that has been "extended" and the special issue planned for November. We're considering a Business Applications issue for October and we want to get some super holiday graphics for December, but we're loath to call that issue a "Graphics" issue. This schedule may well change slightly as we get things geared up for 1983.

The other thing which happened to us last month was that we *finally* got some real office space—some 1500 square feet. That makes it easier for us to coordinate everything, keep track of it all and the like. It also means that, for the first time, we have all our Color Computers together and that we can test and run several things at one time. Nope, our address stays the same. But, use the Post Office Box if you can, because it is faster. At least this month we didn't have to lay *the RAINBOW* out while they were putting up drywall.

Also, you may note that you are getting your favorite computer magazine earlier and earlier each month of late. Its partly because we have advanced our internal deadlines. But it is also due to the natural mail slowdown in the summertime. The "arrival date" will creep back a bit in the Fall and will be bad when it conflicts with the holiday mail at Christmas. We are trying to to gradually push our deadlines up to compensate for that all.

Almost finally, we would like to hear from you about what you want to see in *the RAINBOW*. We do get a good deal of mail, but I read every single letter and card. And do contribute programs to us. If *you* want to support the 80C, you can reach more owners on these pages than anywhere else in the world.

For instance, do our programs interest you? What do you want to see more of? We've made it a policy to have at least one "game" program every month. Is that good? Or is it getting to be a bore? We have gotten excellent feedback on the NFL series and the Universal Data Base. Does that indicate you want more sports-related and business-type programs? How about educational materials?

And what about this column? Do you like all this talking about the magazine and what's happening, or would you prefer pontification on various issues (we *do* do some of that now). Should we have a think-piece, something like *My Turn* in *Newsweek*?

Ah, yes, finally. I want to share the nice surprise I received from Arnold Pouch of Superior Graphic Software, the inventor of Motion Picture Programming, the other day. I wish I could also reproduce the sound track of his banjo-strumming from the hills of the Tar Heel State, but I can't. I do figure, though, you might enjoy seeing Arnold's own "Birthday Card" to *the RAINBOW*.

—Lonnie Falk

Submitting Material To the Rainbow

Contributions to *the RAINBOW* are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other 80C owners.

Program submissions must be on tape or disk. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the submission works. We're much more interested in how the program works and runs than in how you developed it. Programs should be learning experiences.

We do pay for substantive submissions, based on a number of criteria. Those wishing renumeration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you a list of more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

Back Issue Availibility

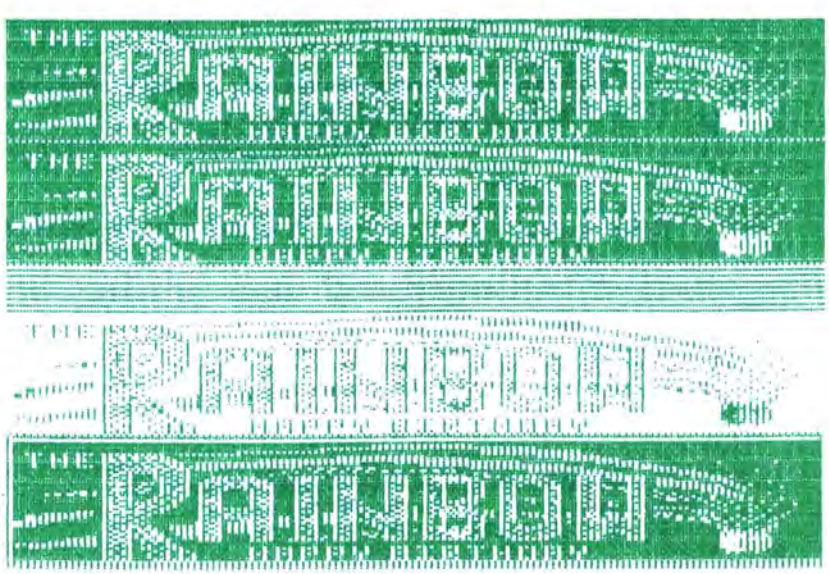
Back copies of most issues of *the RAINBOW* are now available.

All back issues sell for the single issue cover price—which is $2 for copies of numbers 1-8 and $2.50 for numbers greater than 8. In addition, there is a $3.50 *per order* charge for postage and handling. This charge applies whether you want one back issue or all of them.

Most back issues are available on white paper in a reprint form. All back issues now available would be $26, plus $3.50 postage and handling—a total of $29.50. VISA and MasterCard accepted. Kentucky residents please add 5 percent sales tax.

Due to heavy demand, we suggest you order the back issues you want now while the supply lasts. The Issue of April, 1982, Volume I, Number 10, is out of print. If it is reprinted, we will advise as to its availability at a later date.

In addition, copies of the *cover only* of the July, 1982, Anniversary Issue are also available for $1 each, plus 50¢ shipping and handling. These are suitable for framing.



Software Review...

Cross Reference Programs Do Top Notch Job

A new name on the software scene, Micrologic, has produced a couple of dandy cross reference programs which will be a real boon to anyone programming in BASIC.

These utilities, *VARIABLE CROSS REFERENCE* and *LINE NUMBER CROSS REFERENCE* do just what their name implies. And, they do it easily and without fuss or bother.

How many are there among you who, on finishing up on a program, just *couldn't* remember where all the GOSUB references in your program came from? Or, have you ever tried to track down a variable to be certain just where each one was? (Yes, I know, we're all *supposed* to write this stuff down so we don't get into messes like this. But precious few of us really do it.)

Enter these fine utilities. *LINE NUMBER XREF* will chart out each of your GOTOs and GOSUBs, THENs and ELSEs. In other words, every time you reference another line, it will list the reference out for you. To the screen, or the printer, or both.

A similar situation is true with the *VARIABLE XREF* utility. It will pick up each variable in a program, alphabetize them, and list them out with reference to each line in which the variable appears. The lines referenced are also ordered—numerically in this case.

Finally, you get a message at the end of the program run that tells how many lines are in the program, how many variables are used (or lines referenced) and how many times the variables are used in toto (or how may times the lines are called).

Both programs require the target program be saved in ASCII format (using CSAVE,A) and, since it reads every letter of every line, the *VARIABLE XREF* program takes a couple of minutes to do its stuff. But both do it extremely well and the programs are self-prompting and adequately documented.

And, we might mention, the price makes them an exceptionally good buy.

(Micrologic, Box 193, 1st Avenue, East Brady, PA 16028, $9.95 for both programs)

Software Review...

ASTRO BLAST Is An Outstanding Arcade Offering

We are not going to start out this review by telling you how *ASTRO BLAST* looks, what it does or what it is like to play it.

Instead, we want to digress for a moment or two on the setting of this outstanding new arcade offering. *ASTRO BLAST* takes place in deep space and you really feel like you are there. There are multi-colored stars, all moving at different speeds, and they give you a feeling of depth unlike any game we have seen for the 80C thus far. Additionally, there is so much going on on the screen at one time once the game gets started that we almost wonder how a microprocessor even as sophisticated as the 6809 can carry it all. Yet it does, and does it beautifully. Get this one just to see the graphics, if nothing else.

ASTRO BLAST is the long-awaited newest entry from Mark Data Products and it was worth the wait (and obvious care) that went into its development. It reaches a new plateau in 80C arcade games. Just as simple as that.

You are the pilot of a ship which must fight off several waves of alien attackers. The aliens, of course, are shooting at you and jumping around the screen while they do so. In addition, there are a number of comets which appear—all trailing little tails—which can destroy you as well. Your mission is simply to destroy as many aliens as you can.

You must do so before your fuel runs out. And, in a nice touch, you don't deal with several little space ships to make this one work—you have a number of shields instead. You can take some hits, which will deplete your shields, before you are finally destroyed.

Of course, there is a way to get more fuel (but not more shields). If you destroy three waves of aliens, you have a shot at the mother ship. And, if you get *it*, then you can dock and replenish your fuel supply. The refueling is one of the most colorful and pleasing aspects of the game—but you have to earn it.

This isn't *Space Invaders* friends. By contrast, that granddaddy of the arcade games is static when compared to *ASTRO BLAST*. The explosions are realistic, the sounds are good and the action is non-stop.

This machine language game is positively outstanding!

(Mark Data Products, 23802 Barquilla, Mission Viejo, CA 92691, $24.95 tape, $29.95 disk)

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COMPARISON CHART	SUPER COLOR WRITER			THE COMPETITION		
System Size	4K	16K	32K	4K	16K	32K
TAPE Text space	N/A	8K	24K	N/A	2K	18K
ROMPAK Text space	2.5K	15K	31K	N/A	N/A	N/A
DISK Text space	N/A	6.5K	22.5K	N/A	0.5K	16.5K
Right Justify		YES			NO	
Video Window		YES			NO	
Edit any ASCII File		YES			NO	

The figures speak for themselves and with professional features like PROGRAMMABLE function string commands to perform up to 28 commands automatically, PROGRAMMABLE text file chaining, PROGRAMMABLE column insert & delete, and right hand JUSTIFICATION with punctuation precedence, the choice is clear but there's still more!

The **Super "Color" Writer** takes full advantage of the new breed of "smart printers" with Control codes 1-31, 20 Programmable control codes 0-255 for special needs and built in Epson MX-80, Centronics 737, 739 and R.S. Line Printer IV, VII, VIII drivers.

CHECK THESE FEATURES!!

HIGH SPEED & normal operations • 32K Compatible • Window • Key beep • HELP table • 128 character ASCII & graphics • Memory left • Lower case • Full cursor control • Quick paging • Scrolling • Word wrap around • Tabs • Repeat all functions • Repeat last command • Insert character & line • Delete character, delete to end of line, line to cursor, line & block • Block move, copy & delete • Global Search, Exchange & Delete • Merge or Append files • Imbed Control Codes in text • Underline • Superscripts • Subscripts • Headers, Footers & 2 Auxiliary footnotes on odd, even or all pages definable position • Flush right • Non-breakable space • 4 centering modes: 5, 8.3, 10 & 16.7 (CPI) • Full page & print formatting in text • Single sheet pause • Set Page length • Line length, Line spacing, Margins, page numbers • Title pages • Printer baud: 110, 300, 600, 1200, 2400 • Linefeeds after CR • Soft & hard formfeed • Works with 8 bit printer fix • and more!

SUPER "COLOR" WRITER DISK

The Disk version of the **Super "Color" Writer** works with the TRS-80C Disk System and has all the features listed above plus many more! Use with up to four Disk Drives. Includes an extended HELP table you can access at any time. Call a directory, print FREE space, Kill disk files and SAVE and LOAD text files you've created all from the **Super "Color" Writer.** Print, merge or append any **Super "Color" Terminal** file, ASCII file, BASIC program or Editor/Assembler source listing stored on the Disk ot tape. The **Super "Color" Writer Disk** version has additional formatting and print features for more control over your printer and PROGRAMMABLE chaining of disk files for "hands off" operation. Print an entire BOOK without ever touching a thing!

Includes comprehensive operators manual.

TAPE $49.95 ROM PAK $74.95 DISK $99.95

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FEATURES

10 buffer size settings from 2-30K • Buffer full indicator • Lprints buffer contents • Full 128 ASCII keyboard • Compatible with **Super "Color" Writer** files • UPLOAD & DOWNLOAD ASCII files, Machine Language & Basic programs • Set RS-232 parameters • Duplex: Half/Full • Baud Rate: 110, 300, 600, 1200, 2400, 4800 • Word Lengths: 5, 6, 7 or 8 • Parity: Odd, Even or None • Stop Bits: 1-9 • Local linefeeds to screen • Tape save & load for ASCII files, Machine code & Basic programs • Unique clone feature for copying any tape.

Super "Color" Terminal Disk

The Disk version offers all the features listed above plus Host ability in full duplex • Lower case masking • 10 Keystroke Multiplier (MACRO) buffers on disk to perform repetitive log-on tasks and send short messages (up to 255 bytes) • Programmable prompts for send next line • Selectable character trapping • Set printer line length • Pagination • Linefeed with CR option • Printer Baud: 110, 300, 600, 1200 & 2400 • Documentation.

TAPE $39.95 ROM PAK $49.95 DISK $69.95

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ADVENTURE 3-PAK Requires 16K Extended Basic **TAPE $24.95**

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Three action packed two player games featuring lifelike graphics and sound of LASER FIRE, CANNONS and PHOTON TORPEDOES.

2-1-0 TANK COMBAT five terrains • the experienced arcade player can design combat scenario. **STELLAR BATTLE** pilot a Flex-Wing Fighter at incredible speeds in enemy space taking out Dorian Tye Fighters defending the Imperial Star Fortress. **GALACTIC BLOCKADE** maneuver your craft in a course that boxes your opponent but avoid cosmic debris and hostile space probes!

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NELSON SOFTWARE SYSTEMS

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Software Review...

SKY-DEFENSE Has Fast-Paced Action

Don't mistake *SKY-DEFENSE* for a copy of the popular acrade game *Defender*. It isn't that, and doen't purport to be.

But it *is* a fast-paced action game that involves many of the features which has made the *Defender* game popular in the arcades. And, it has nice colors and sound, good joystick control and a feeling of being "there" that will get to you.

You are in control of a plane which you can fly up and down, forward and back across the screen and across terrain. Enemy ships fly at you, and you must shoot them before they shoot you. There is no "long-range radar," so the enemy just pops onto the screen in various places and intervals. They are shooting at you, and you have to get them first—or dodge out of the way.

SKY-DEFENSE is written entirely in machine language, and is, thus, fast and extremely responsive to joystick control. By allowing you to fly all across the screen, the program gives you lots of options to attack. And, a nice graphic feature is that when you fly "backwards," the terrain stays in place so that the appearance of movement in the forward and backward directions is heightened.

We believe those who like arcade games will like *SKY-DEFENSE*. So long as you don't expect a *Defender* copy, we believe you will be very pleased with this offering.

(Quasar Animations, 1520 Pacific Beach Drive, San Diego, CA 92109, $22.95)

Software Review...

Adventure 3-Pak Starts Slow—Gets Better

At last, we thought, a super graphics Adventure game—or series of games. Not quite so, although the graphics are better than much of what we have seen and *ADVENTURE 3-PAK* does provide some interesting challenges for the adventurer.

This series of programs is loaded in separately. As you "pass" through one, you can get to the other. The programs are basically written as wandering through a maze, with a number of hints, secrets and the like for you to discover. As with any Adventure, the play can be rewarding or frustrating, depending on how well you do.

The first segment of the package is probably the poorest, although the graphics of the figures are quite good. You must battle a couple of enemies, and it is the combat that seems almost stilted. The fighting is not in real-time, as in seeing the two combatants doing their thing.

For those who survive the "ritual combat," the next program in this series loads a picture of a castle which, after walking in, confronts you with a maze. There are stairs, walls and doors, and all of this is very good in terms of graphics. The reaction to the commands is fast, too, so you can move about easily.

That is about all we will tell you. To delve further would ruin the playability of *ADVENTURE 3-PAK*. Our main complaint with the game, basically, is one that would apply to many non-disk graphic Adventures, there is just so much that you can load into the 80C's memory at one time. With a disk, of course, you will be able to load various scenes over and over again, giving a much greater variety to the process.

ADVENTURE 3-PAK is by no means a bummer, but it does have its limitations. If you like Adventure games, you will probably enjoy it once you get through the first segment.

(Nelson Software Systems, P.O. Box 19096, Minneapolis, MN 55419, $24.95)

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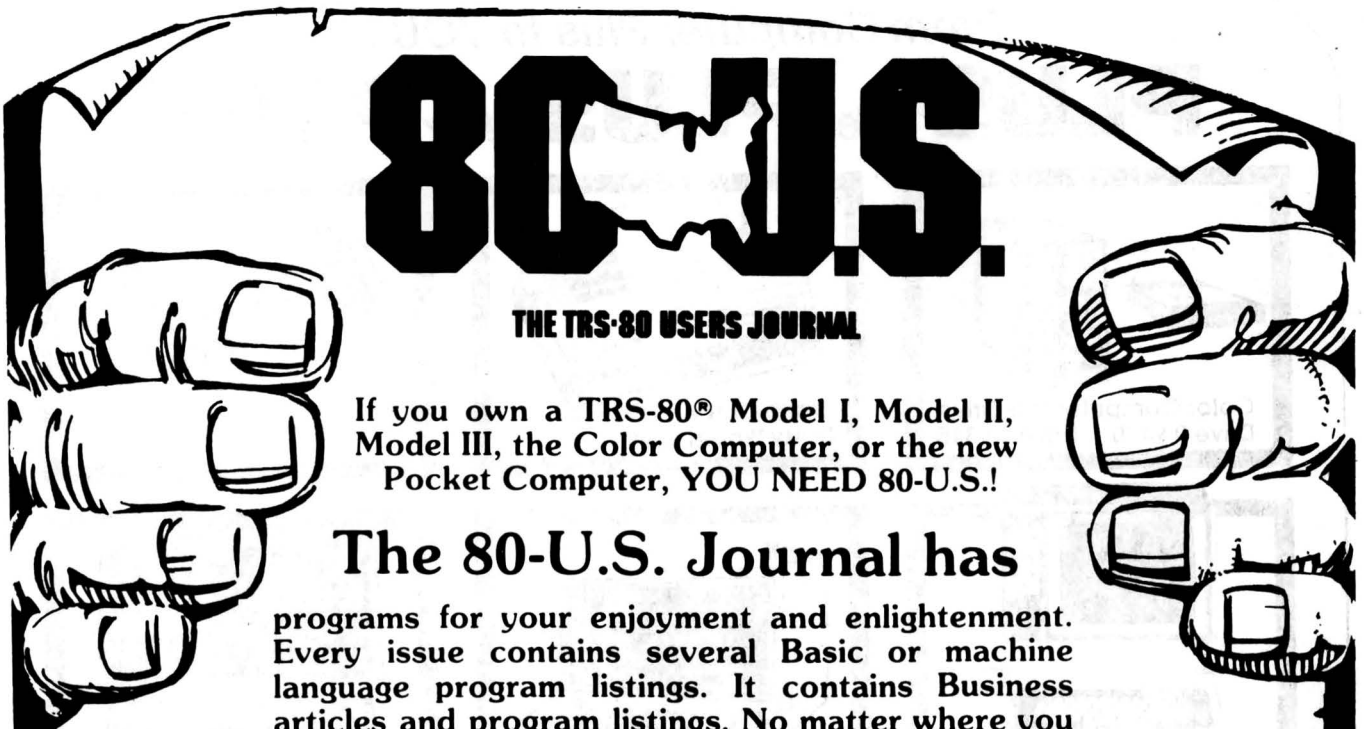

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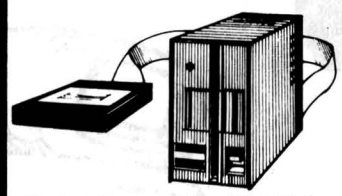

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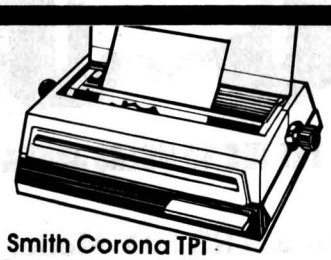

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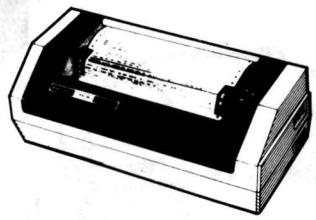

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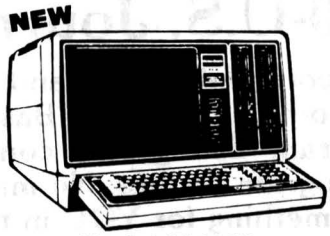

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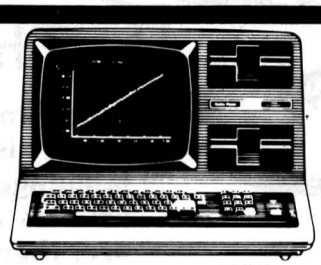

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Rainbow Feedback...

Converting Programs From Other Computers To Your 80C

By Lawrence C. Falk

One of the questions that it seems we get asked more than any other is how to convert a program from another computer to the 80C.

This usually comes up when someone finds what looks to be a really interesting program in some book or magazine and wants to make it run on his or her Color Computer.

First of all, a little background.

If you have been reading these pages for any length of time, you will know that the 80C is operated by a MC6809 microprocessor. And, while it is not the *first* 6809-based computer system to be marketed, it is by far the most popular. For that matter, it is also the first to be widely sold, thanks, primarily, to Radio Shack.

When Tandy decided on the 6809, they chose the most powerful eight-bit processor available today. This chip, manufactured by Motorola, is a real gem. And, by adding the SAM chip to the configuration, Radio Shack, frankly, gave the 80C buyer more microprocessing "bang for the buck" than anyone else. The technical experts have marveled that they packed so much into this little machine. And, that is one reason why you see so much software and so many different possible kinds of things becoming available for the 80C. It just has so much power that it can do a great deal more than anyone really thought about when it was introduced about 18 months ago.

For that matter, there are *mainframes* which run on the 6809. But, all that is another story.

What is germane to the subject of converting programs is that, aside from the 80C, there is precious little in the way of software for the Microsoft Basic which our favorite computer uses. (This is getting to be less and less important, by the way, because there is so much new software being written for the 80C.)

But no matter. The two best-selling micro systems over the past few years (aside from 80C) have been the Tandy Models I, II and III and the Apples. Tandy's earlier machines were (and are) all based on the Z-80 microprocessor. Apple's (and the Pet and Ohio Scientific as well) are based on the 6502 chip. Even Tandy's newest, the Model 16, runs partly on a Z-80 (actually, a Z-80A). But the rest of it, the powerful operating system, runs on a 68000 microprocessor from, you guessed it, Motorola. That is a full 16-bit processor.

All of this *does* have something to do with the suject of conversions, so stay with me for a couple more minutes, please.

How BASIC Works

A company called Microsoft authored the Basic, both Color Basic and Extended Color Basic, for the 80C. But that is no matter, because many of the BASICs available today were written by Microsoft. The thing that *does* matter is what it takes to write a BASIC in the first place.

Remember, all BASICs—and all "high level" languages like it, COBOL, FORTRAN and so on—use an interpreter. That's what Microsoft writes. That is so that when you type in a keyword like, for instance, PRINT, the interpreter analyses it, sees what it says, and converts (or interprets) it into machine code. That takes some time. BASIC is an interpreted language. That means it goes through this process of having the interpreter convert its keywords into machine code each time *the keyword is sent to the microprocessor.*

Now. If you have looked at any machine language programs (there are a couple in this month's issue), or followed Dennis Lewandowski's *Assembly Corner* you will see that what machine language is made up of is merely a bunch of hexadecimal numbers which become instructions to the microprocessor in binary form.

Look at those hexadecimal numbers. They are things like 06, FF, EF and so on. And, if you wish to load the A Register with a number, you send a hexadecimal number to the microprocessor, which its native instruction set tells it means Load A (that's a $86 in the immediate mode, by the way).

But that is no matter. What is important is that as a company like Microsoft develops the BASIC for a computer, it has to work within the confines of the microprocessor on which the computer will run. So, if you decide to start building computers and you contract with Microsoft to write the BASIC for you, they will write a different set of instructions depending on two things.

The Plot Thickens

The first, and probably most important thing, is which microprocessor you have decided to use. All of them operate differently. So, when you tell a Z-80 to PRINT, the instructions that are passed to the Z-80 will be different than those that would be passed to an 80C.

The second consideration is what you want to have included in your BASIC. You have the best example of this sort of situation sitting in front of you in a little silver box. Tandy had Microsoft include a whole range of graphics commands in BASIC that, at the time, were not available on any other computer system. Little gems that you take for granted such as LINE, PAINT, CIRCLE and so forth are new keywords written— or "invented" as it were—for Radio Shack.

Yes, you *can* draw a circle on an Apple II. But you need machine language programming experience (or a whole program) to do what you can accomplish with Extended Color Basic on the 80C.

So, these two considerations are the ones which go into making a BASIC for a computer. Any computer. The person who writes the interpreter must deal first with the microprocessor that is being used and, second, with what keywords (or, really, functions) the manufacturer wants to include.

Fortunately, you do not have to worry too much about all of this. Because, when you type in a BASIC keyword that your 80C's BASIC recognizes, you have already put it in the format (machine code-wise) that is necessary for your interpreter to understand it.

If Its Yours

That is provided, of course, that such a keyword exists in Color or Extended Color Basic.

Suppose you find a program which looks interesting, take a little time, and decide to enter it in from the keyboard into the 80C. It is an Apple II program, but no matter. Because, like we just said, as you physically type it in, it will be accepted by your own BASIC.

—Continued on Page 81

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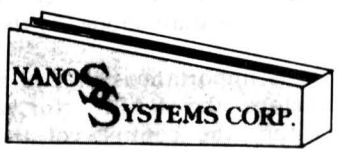

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CONVERT — from Page 79

Here we go. The first line has some DIMension statements in it. O.K., that's easy. Now here's the second line, and it has a GOSUB. No problem. And the third, its PRINTing the name of the program on the screen. Then, in the fourth line there is a FOR/NEXT loop to delay the program and keep the words on the screen so they can be read.

Hey, this is really easy. Now, the fifth line. Here we tell the 80C to HOME. ***HOME???!*** What's HOME? Where the heart is? On the Range? Are there deer and other creatures playing games inside this machine?

"Baby, I want to go home. I'm tired and I want to go to bed." Whoever heard of this HOME thing. I thought this conversion thing was easy.

HOMEing In On The Problem

You, my friend, have just HOMEd in on the problem of converting programs. As you know, there is no such thing as HOME for the 80C. You *can* type in HOME after the line number just like the listing shows. But, its best to stop there and run that line.

See the pretty ?SN ERROR on your screen?

As my kindergarten teacher, Miss Goosetree, tried to teach me not to say, there ain't no such thing as HOME in this computer! The ?SN ERROR is the 80C's way of telling you it does not recognize such a command. But then, you knew it all the time. Right?

Well, lets just leave HOME out and see what happens. We'll go on to the next line where the program seems to be getting nasty. Its GRrrring at us now. Oh, foo. Let's forget the whole thing! What's a GR, anyway?

We've been a little too graphic in these examples, perhaps. But, just for the record, HOME is, for all practical purposes, the same as CLS. It clears the screen and HOMEs the cursor to the upper left-hand corner of the screen. GR is a command that sends the Apple from the text mode into the Graphics mode. It also clears the Graphics screen.

Truth be it known, converting graphics programs from any system to the 80C is a bear. In many cases, its pretty much an entire re-write. But, let's delve into this just a bit further, now that we know what HOME and GR will do.

How To Convert

There are a lot of programs you can convert with some manner of ease, particularly if you have a good familiarity with the syntax of your own BASIC. The easiest programs to convert are those for the other members of Radio Shack's family, because much of the BASIC is similar.

You can also upgrade while you convert. For instance, Level I Basic doesn't have nearly all the commands that even ordinary Color BASIC offers. And, while there are a few things that are missing from Extended Color Basic that show up in Level II Basic, they are not all that important.

Those "missing commands" are primarily the error-handling routines and the ability to define double and single precision numbers. Handy, yes. Essential, not usually.

For an example of what I mean, let's look at error-handling. There is a command which you can use in Level II that will tell the computer that if you get a division by zero, it should not Break out of the program and print an error statement (?/0 ERROR), but should do thus-and-so instead.

That's handy. But you can get around it simply by testing the variable in the division formula *before* you tell the 80C to do the division. And, if you would have had a zero as the divisor, just have the 80C skip the division step.

Yes, it is a little more complicated. But it is nothing that will prevent you from converting the program.

But, the further away you get from the BASIC Microsoft wrote for the 80C, the more trouble you will have. And the more fancy a program, the more chance there will be some trouble.

Pitfalls And Prattfalls

There are some obvious pitfalls to watch for. We have already mentioned one of them: Graphics. No computer system has a screen layout like the 80C. If you want to work on a Graphic program, go ahead. But don't expect it to be easy and plan to do a lot of rewriting from scratch.

Other things to watch for are USR calls, and anything that POKEs or PEEKs. Forget it. The ROMs are where the operating system codes are, and they are vastly different on different systems. You would have to be throughly familiar with the ROM setup in both the 80C *and* the machine from which you were trying to convert the program in order to have a chance to do this properly.

You will have to do some work with screen formats as well. The 32 character line on the 80C is different from any of the other systems. I have found the best way to do this sort of thing is to use abbreviations and the line to "shorten" the heading lines. Also, PRINTUSING can help "crowd" information from variables on the screen.

Look at the CHR$ functions carefully. For instance, a CHR$(31) will clear the Model III from the position of the cursor to the end of the screen. You can't do that directly with the 80C (but there is a way to accomplish the same thing).

Most important of all, look for ways you can *enhance* a program when you convert it to the 80C. You can certainly do a lot with the Graphics, but the flexibility of the operating system will allow you to do other things as well. For instance, you cannot use LINEINPUT with Models I/III unless you have disk. It is available with Extended Basic for the 80C and is a very powerful command.

Other Help

For Model I/III programs, you do not even have to type in the listings because there is a utility available from Spectral Associates (P.O. Box 99715, Tacoma, WA 98499, $24.95) that will allow you to load programs for those computers directly into your 80C. It will also help in some of the conversion.

The 80C Color Computer System Card from Nanos Systems Corp. (P.O. Box 24344, Speedway, IN 46224, $4.95) is an in-depth look at the commands, syntax and routines for the Color Computer. I have used it to great advantage in doing some of my conversions. Also, if you will be converting a lot from a specific system, Nanos has system cards for all the Radio Shack computers as well as the Apple II and Apple II Plus.

For a comparison of all the statements in all the BASICs, *The BASIC Handbook* by Dr. David Lein is an excellent collection of information about the various (and, sometimes, mysterious) commands in the other "dialects." It is published by CompuSoft Publishing Co. and may be available at your local computer store.

Armed with these three weapons, you should be able—plus your own understanding of the 80C—you should be able to convert almost anything that can be converted.

Have fun and good luck.

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New York, N. Y.
The Computer Store
San Diego, Calif.
The Computer Store
Tulsa, Okla.
Computerland of Louisville
Louisville, Ky.
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Louisville, Ky.
Computer Resource
Williamsville, N.Y.
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Shreveport, La.
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Encinitas, Calif.
Cosmos Computers
Bettendorf, Iowa
Crouchet Electronics
Conroe, Texas
Dallas Computer Center
Dallas, Tex.
Delker Electronics
Smyrna, Tenn.
Disney's Electronics
San Diego, Calif.
Dimensional Software
San Diego, Calif.
E. B. Garcia & Associates
Chicago, Ill.
The Eight Bit Corner
Muskegon, Mich.
Game Preserve
Indianapolis, Ind.
Guild Books and Periodicals
Chicago, Ill.
Home Computer Store
Westerville, Ohio
HW Electronics
Northridge, Calif.
Kelly Software Distributors
Edmundton, Alta.
Leo's Book & Wine Shop
Toledo, Ohio
Little Professor Book Center
Philadelphia, Ohio
Little Professor Book Center
Canton, Ohio
Multi-Mag
London, Ont.
OPAMP Technical Books
Los Angeles, Calif.
Parkwest Books
Chicago, Ill.
Personal Software
Malvern, Pa.
Printers, Inc.
Palo Alto, Calif.
PCLEAR 80
Mansfield, Ohio
The Program Store
Baltimore, Md.
The Program Store
Falls Church, Va.
The Program Store
Washington, D.C.
Radio Shack
El Cajon, Calif.
Radio Shack
Freehold, N.J.
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Rainbow Software Services
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Soft Sector Marketing
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Software City
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Software Concepts
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Software Unlimited
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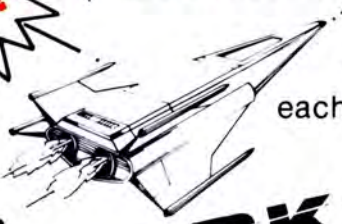

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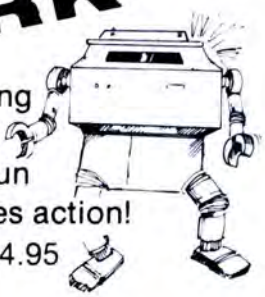

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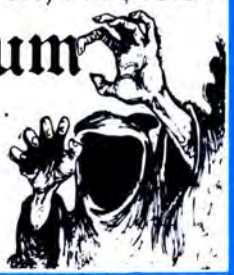

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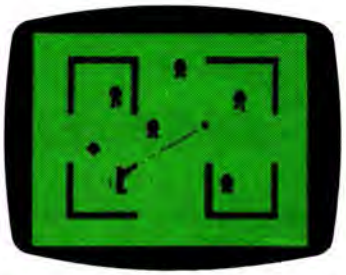

ROBOT BATTLE

Can you dodge the never ending horde of robots while avoiding the fatal touch of the Android? Realistic voices and 16 skill levels provide a tremendous arcade type challenge. Joysticks, $21.95.

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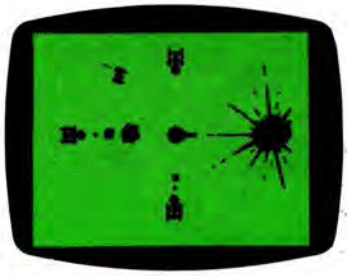
Maneuver your spaceship through the defenses of the Death Star for the killing shot while avoiding space mines, enemy ships and the gravity pull of the BLACK HOLE. Two color hi-res graphics - $21.95 Joysticks



COLOR ZAP

Super new space game! You must dodge the incoming photon torpedos before they can penetrate the defenses of your ship. Once you think you've got the upper hand, defensive fighters may appear and attack. $9.95

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If you like Space Invaders, you'll love Galax Attax! Alien fighters leave formation to attack your ground base and you must fight them off! Exciting, fast-action machine language game with super sound and high resolution graphics. 16K and joysticks required. $21.95

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If you have a 32K E series printed circuit board, the **SUPERCHARGER** will let you switch your computer to full 64K RAM mode. It just plugs into the ROM PAK port and you can use BASIC or not as you wish. NO MODIFICATION is needed and it will not void your warranty. It allows you to still plug ROM pack and/or the disk controller board into the computer. ONLY $39.95

FLEXPLUS DOS

FLEXPLUS is a powerful, easy-to-use disk operating system. Spectral Associates has adapted TSC's FLEX to the best DOS completely compatible with Radio Shack software for use on the Color Computer. Eliminate the need for Radio Shack's TRS DOS - use **FLEXPLUS** with Editor/Assembler and have the options of a full range of utilities. **FLEXPLUS** works on the 32K Radio Shack disk system with 64K memory chips with a High Resolution multi-screen format that supports a 24 line by 51 character display! Also included are special enhancements to Radio Shack's Disk system when you are running FLEX with single or double sided, single or double density, 35, 40 and 80 track drives.

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THE FACTS

At last, a complete description of the "guts" of the Color Computer. Specs on all the ICs, complete schematics, theory of operation and programming examples.

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